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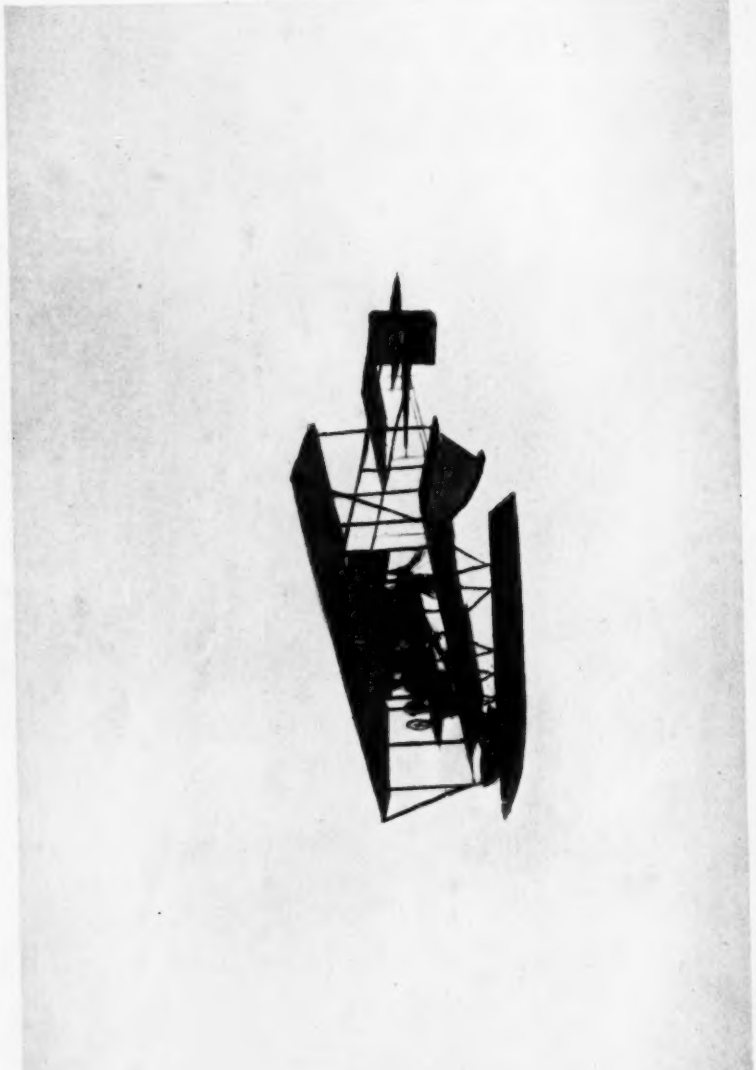

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 41, No. 3 MAY-JUNE, 1915 Whole No. 157

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

First Honorable Mention, 1915

AN AIR FLEET: OUR PRESSING NAVAL WANT

By COMMANDER THOMAS DRAYTON PARKER, U. S. Navy

Motto: "Too late on earth may be too soon in hell!"

I. INTRODUCTORY

Rapid as have been the changes in aeronautics during the past few years, the art is now, particularly, in a state of flux. In the great theaters of European war the experience of years is being compressed into days. Here and there, where the curtain is lifted, we see battlefields dominated by Taubes and Farmans in a maze of bursting shrapnel, and huge dim shapes of Zeppelins, lurking by night over unlighted cities. There are signs of great developments, of great enterprises on foot. Owing not only to the rapid changes, but also to the quick droppings of the veil, it is extremely difficult to systematize these snapshot teachings of recent aviation. Yet our need of studying it "with prayer and fasting," and of making headway in our overhead defence has never been more pressing. The alarm has been sounded for army and navy: but we are in danger of finding ourselves, when the trying hour comes, in a bomb-proof without a top.

Let us remember, too, that "A stern chase is a long chase."

This question of "closing up" in aeronautics is of vital importance to the United States. Our reliance has been on a powerful navy to keep an enemy from overwhelming our brave and efficient,

yet ludicrously small, army. But if the enemy have undisputed command of a parallel route to our coasts, the navy fails in its purpose and the Monroe Doctrine becomes archaic. Moreover, since we so severely limit our military budgets, we must seize, more eagerly than other nations, inexpensive weapons of great and known efficacy, like the submarine, the destroyer, and the airship. And if *one* aeroplane can be hurriedly built, it takes years to establish home plants, build a fleet, and train a personnel.

II. TYPES OF AIRCRAFT[1]

Before discussing the air fleet and its uses, we must give a few preliminary definitions and a clear idea of the types considered.

Kites and Balloons.—These may be dismissed with a few words. The kite is no longer important as a military asset. Most of the military nations have given it respectful attention, and but for the arrival of the aeroplane might have awarded it high honors. It has been used for dragging explosives over fortifications, and (with marked success) for photographing an enemy's works. The Germans employed a military balloon kite, with the ordinary characteristics, except that it was inflated with hydrogen, had greater lifting power, and would stay aloft without wind. The cellular and the tetrahedral forms developed in the United States have given excellent results. Experiments from the U. S. S. *Pennsylvania* showed that a kite can support, several hundred feet above the ship, an officer whose spotting signals are easily read. It can lift the observer to a height of 1500 to 2000 feet,

[1] Acknowledgment must be made to numerous articles in current books, magazines, and papers, that have been used in the preparation of this paper. Special mention may be made of White and Harper's "The Aeroplane in War"; "The Curtiss Aviation Book"; the chapter on Aeronautics in "Brassey's" Naval Annual, 1914; articles by Captain Chambers in the U. S. NAVAL INSTITUTE PROCEEDINGS, 1913; various articles in service magazines by Major H. Bannerman-Phillips of the British Army; "Aircraft in War," by Col. F. H. Sykes of the British Army (*Quarterly Review*); "L'Aviation Militaire en 1912," by Lieutenant Albert Vallet of the French Army; "Aircraft in Naval Warfare," by "Gitchie Gumee" (*United Service Magazine*); "Principles of Naval Aeronautics," by Late Naval Constructor Pietzker of the German Navy (translation in the U. S. NAVAL INSTITUTE PROCEEDINGS); and "Present Status of Airships in Europe," by Assistant Naval Constructor Hunsaker, Instructor in Aeronautics, Massachusetts Institute of Technology (*Journal Franklin Institute*).

whence fire may be directed by telephone. It is not vulnerable, compared with other aircraft, and can be readily transported or replaced; but, unfortunately, it can only be used in winds of 20 to 40 miles per hour, and is of course not mobile in the sense applying to other aircraft.

The (captive) balloon is still in vogue for fire control and for military observation—the Germans used it at Antwerp. The wandering type also is good for the training of aeroplane pilots and observers in "airmanship." The Russian lookouts reported a Japanese balloon in the Sea of Japan shortly before their ill-fated meeting with Togo. But for the purposes of this article, the balloon must be classed with the fine old square-rigged ship.

In his annual report, General Scriven, Chief of the Army Signal Corps, gives it these few words of doubtful praise:

> The captive balloon, too, has its uses, but they are limited. Observation from captive balloons, which must necessarily be sent up some distance in the rear, is a poor substitute for the direct overhead reconnaissance obtainable from aeroplanes or dirigibles.

Of modern aircraft, we must deal with three principal types: Aeroplanes, seaplanes or hydro-aeroplanes, and airships or dirigibles. The British term seaplane is much neater than our "hydro-aeroplane" or "hydroplane," though the word "dirigible" is more specific than their "airship." Where the meaning is clear, aeroplane will be used as a generic term including both "land-planes" and seaplanes. Dirigibles, as noted below, are subdivided into three classes.

Aeroplanes.—These divide, of course, into biplanes or monoplanes; and into "one-place" or "two-place," according to whether the pilot is alone or carries company—an (armed) observer or mechanic. Three- and four-place machines are not unknown, and Grahame-White has a "char-a-banc" for nine passengers. The Russian Sikorsky has eclipsed all rivals by building huge aeroplanes with seats for 18. His *Ilva Murametz* has a covered-in fuselage measuring 65 feet from nose to tail, with a small cabin for two pilots, a larger one for passengers, a small sleeping apartment, and a very small lavatory. No buffet is yet reported. Each compartment is lighted by electricity and heated by the engine exhaust. This machine, which is made of wood, is slow compared to the small fry; it may be taken as the last word in size for some years to come. As to speed, good

military machines range between 60 and 90 miles per hour; a few make over 100 miles, and the record is said to be 124. A run of 6 hours at 75 miles per hour is good, but not unusual, and continuous flights of 8 to 12 hours excite no wonderment. The record has crawled up to 25 hours. Machines can climb 400 to 500 feet per minute, rising not so fast as dirigibles, but higher—up to 20,000 feet. For military purposes many are armored; since anti-aircraft guns reach to 5000 feet, while detailed observation is difficult above 2500 feet. For fighting, the aeroplane has an automatic rifle, a few small "bombs," arrows, and, at best, a small rapid-fire or machine gun. French biplanes have been equipped with a lighting system for night work; the use of searchlights by night-fliers has been reported. Small wireless installations have been common, and various devices for signaling.

The standard German monoplane, the sky-blue Taube, is modeled from the leaf of the Zanonia tree, which, from its shape, is wind-driven for miles. The Taube is made of steel; and, though easily controlled, is slower than many British and French machines. As the pilot cannot see behind or below, it is bad for bomb-dropping or defence from an overtaking foe. Many Taubes have been overtaken and brought down by airmen on the other side. The standard German biplane—the Arrow—is also of steel, and though faster than the Taubes, is slower than the best British biplanes, some of which cover more than a hundred miles per hour.

In *seaplanes* the British seem to lead, both as to quality and numbers. It is asserted that their Sopwith machines won in a canter in an open competition at Monaco. The German requirements for this type are:

(a) Must be two-place machines.

(b) Must carry fuel for four hours.

(c) Normal speed of at least 62 m. p. h.

(d) Must be able to alight on a rough sea, with a wind of 15 m. p. h., and remain there, with motor stopped, for one hour.

(e) Must be able to start flight from a rough sea, in wind or calm.

(f) Must fly for at least three consecutive hours.

With other conditions as to seating and facilities for observation.

We have as yet no American machine that satisfactorily meets conditions (d) and (e); but our own experience has demonstrated that the aeroplane can make flights from and back to the deck of a ship (witness Ely's beautiful flight to and from the *Pennsylvania*); and that the seaplane can alight, in smooth water, near a ship, and be readily hoisted aboard. "Brassey" suggests that future seaplanes may be fitted with water propellers; and even that the air propellers may be used to turn these, converting the seaplane into a wind-driven boat independent of fuel.

Reference should be made to the "stabilizer," a recent gyroscopic device for relieving the aeroplane pilot of the task of constantly adjusting the balance of the machine. Arrangement can readily be made for throwing it out of gear in tight places where human control is essential. In a test abroad, Mr. Sperry (son of the inventor) is reported to have stood up in a "stabilized" machine with both hands in air while the mechanic actually climbed out to the tail. The machine after trembling a little continued its straight and peaceful flight.

Dirigibles.—The *dirigible* is defined as "a self-propelled airship in which the lifting force is given by a gas-filled envelope beneath which cars are suspended for the accommodation of the power plant and passengers"—or, more concisely, as "an animated gas bag." It may carry several rapid-fire or machine guns (in the car, or even on top of the envelope for overhead protection), a crew of 10 to 20 officers and men, various articles of equipment, and a ton or more of high-explosive "bombs." Its average cruising range may be taken as 1000 miles (say 25 hours at 40 miles per hour), but this radius is extending towards 2000 miles and more. This makes it, as compared with the aeroplane, a long-range instrument. The following data gives an idea of a large, modern, German Zeppelin:

Displacement in tons	30
Length in feet	550
Diameter in feet	61
Speed in m. p. h.	50

The volume of gas in such a ship is about 800,000 cubic feet. A later Zeppelin is designed for a speed of 62 miles per hour. The very latest make 65 miles, almost keeping pace with a good aeroplane.

The equipment of a large dirigible includes guns, radio set, "bombs," bomb-releasing device, searchlight, photographic apparatus, barometer, compass, fire extinguisher, medical box, and various instruments for the management of the ship. A camera—described as a "miniature cinematograph"—has been devised for use with aircraft. It relieves the observer of the strain of constant record-making, leaving his eye free for "high places," and may be adjusted, at pleasure, for a continuous record, or for snapshots at regular intervals.

Dirigibles are divided into three important classes: *Rigids* (Zeppelins), *non-rigids,* and *semi-rigids.* The *rigid* has a supporting framework of aluminum, wood, or steel, and (important and characteristic) can be subdivided into cells—small gas-bag units within the large envelope. This construction, like the water-tight compartment system with ships, makes for safety in battle, since a shot may pierce one cell (or several) without deflating the balloon. The rigid is therefore the only "battle airship." The largest and fastest ships are of this type; they are frequently spoken of as Zeppelins, though other makes, such as the Speiss or Schütte-Lanz, are important.

The *non-rigid* type has neither ribs nor keel, but is held in shape by gas pressure from within. Since this pressure maintains the form, the cellular division cannot be used, and a rent in any part deflates (and wrecks) the ship. An effort is making towards subdividing non-rigids; but, though that is the latest tendency, none can yet risk shell fire (as to *rifle* fire only, balloons have been *riddled* without coming down). The non-rigid is therefore analogous to the scout on the seas: useful for reconnaissance and other auxiliary work, vulnerable as a gas tank if reached by hostile fire.

The *semi-rigid* is a compromise, sharing some advantages and some disadvantages of both battleship and scout. It has a rigid keel, within which (in the Forlanini type) the car is built. It has less head-resistance and dead-weight to carry than the rigid; but is less safe than the other types, and, with its cumbrous keel, is harder to transport than the easily deflated non-rigid. (For more detailed comparisons, see below).

Zeppelin frames are made chiefly of aluminum. They consist of longitudinals and of transverse partitions that divide the frame into sections, in each of which is a balloonette, a separate unit

containing gas. These balloonettes are made of gold-beaters' skin, which is impervious to gas. The outer envelope is of waterproof linen. There are three cars close under the envelope to lessen head resistance. The ship is fitted with fins to give stability, and with horizontal and vertical rudders. A funnel through the center leads to the upper platform on which the "sky-scraping" gun is mounted. There is water ballast, which can be immediately and safely spilled.

The non-rigid and semi-rigid envelopes cannot be made of gold-beaters' skin, which is too weak, and require some rubberized fabric from which the loss of gas is about 1 per cent a day. The non-rigid can be readily deflated and packed for shipment.

The nature of a non-cellular (non- or semi-rigid) dirigible was well illustrated in Italy when the aviator of a Farman biplane engaged in battle practice against a Korting dirigible. In one of his mock attacks he apparently misgauged the distance: for instead of just clearing the dirigible, he rammed it. The result was an immense rent in the airship's side, a sudden outpouring of gas, a burst of flame, and a fiery orb hurtling to the ground. The crew were killed, and also the aviators on the aeroplane. Various devices have been used to diminish this danger—double envelopes, strips of fabric inside to be sucked into holes and stop the flow, etc. On the other hand, an explosive grapnel trailer has been suggested, which, dragged by piano wire from an aeroplane, will rip the envelope, explode, and destroy the dirigible. Non-rigids are exposed to destruction by bombs dropped from aeroplanes overhead. True, the dirigible can ascend faster; but it is usually slower, and the danger from a squadron of aeroplanes attacking at different heights from various directions will be great. Indeed Jayne says in his "Fighting Airships" (1913):

> A single aeroplane should be able to disable or destroy without very great difficulty the finest dirigible yet built (supposing it able to find the airship in the vastness of the air).

This view may not take account of the latest anti-aircraft weapons of dirigibles, especially the gun mounted on top of the envelope: but even Zeppelins will have to look alive unless they give hostile aeroplanes the slip. At present, it seems practicable to do this.

Summing up the advantages and disadvantages of the dirigible as contrasted with the aeroplane:

Advantages.—The dirigible is superior in range and power.

(1) It can make long flights over seas or across hostile territory.

(2) It can carry from one to eight tons of explosives, and drop "bombs" or great power and weighing as much as 1300 pounds, while the aeroplane can only carry four or five projectiles weighing 80 to 90 pounds each.

(3) It can *hover* for observation or for bomb-throwing, while the aeroplane must keep in rapid motion.

(4) It can sail slowly over the terrain examined, giving opportunity for leisurely observation.

(5) It affords a stable gun platform.

(6) It can have an adequate wireless installation, with relatively long range; and can receive as well as send messages (by means of a sound-proof booth). The noisy aeroplane cannot *receive*, though mufflers may be fitted in future. The wireless affords quick communication that aeroplanes often lack.

(7) If the dirigible's motors break down *it is still a balloon.*

(8) Finally, and highly important, it can work *at night*, with relative immunity from hostile fire, while the aeroplane can fly safely only by day. Some progress has been made in night aeroplane flying with the aid of a small searchlight or of illuminated landing places: but such attempts are hazardous. Only recently a well-known British aviator was killed, after a midnight patrol flight over London, through mistaking his distance to the ground.

Disadvantages.—The dirigible is costly and vulnerable.

(1) It costs from 20 to 35 times as much as the aeroplane.

(2) It presents a much larger target and is far more easily destroyed by shell fire or by hostile aircraft than the aeroplane.

(3) Hence, by day, it must travel higher, with corresponding difficulties of observation. If the enemy are beneath, safety does not lie below 5000 feet.

(4) It requires large and expensive sheds that must cover the field of operations and cannot be improvised (non-rigids can moor temporarily to a mast). It has a bad habit of outgrowing these sheds.

(5) There is grave danger of injury in leaving and entering these sheds, especially if a cross wind be blowing. Germany has met this difficulty by installing revolving sheds (very expensive).

(6) It must have better weather for maneuvering.

(7) It is less speedy than the aeroplane, and cannot always escape the "destroyer" of the air.

(8) It is less readily transportable by sea or rail. This applies chiefly to the rigids and semi-rigids, but even a non-rigid requires a gas plant at the end of its journey.

(9) It requires a supply not only of gasoline, but also of gas, which must be constantly renewed (less applicable to the rigid). There are losses through leakage, for ascent (due to escape through relief valves), and for descent.

The logistic relation between a Zeppelin and an aeroplane is somewhat analogous to that between a steamer and a "wind-jammer."

In the present European war the aeroplane has so far (December 15, 1914) been much the more useful. But dirigibles—"the fleet in being"—have been held in reserve, and the world is waiting.

If we should enter the lists with the dirigible, the question of type will be vital. Should we put our faith chiefly in Zeppelins like Germany, or in non-rigids, like Great Britain and France?

A detailed comparison of these types will be found below.

III. APPLICATION OF TYPES TO NAVAL WARFARE

Having now some idea of the types to be considered, we must look into their application to war on the sea.

It is beyond question that the paramount duty of both dirigibles and aeroplanes, in which their usefulness is proved, is *reconnaissance*.

Reconnaissance.—In his annual report, the chief signal officer of the army says:

> . . . . Whatever may be the conclusions drawn as to the use of aircraft for offensive purposes in warfare, and as to the importance of the dirigible, there can be no doubt of the value of the aeroplane in rapid and long-range reconnaissance work, and of its power to secure, and to transmit by radio, visual signals, or direct flight information of importance to armies in the field. So true is this that it seems probable the aeroplane and, to some smaller degree, all aircraft have altered, not the principles of strategy, which are immutable, but the theory and application of grand tactics. It now appears that the actual game of war is played openly, with cards on the table . . . .

This passage is here quoted once again, not only for its happy and impressive phrasing, but also because it applies with equal force to naval warfare.

For long-distance oversea scouting, the dirigible (rather than the aeroplane) will be essential in future wars; the aeroplane's high usefulness will be for shorter flights. It is safe to say that in a few years the radius of dirigibles, now over 1000 miles, will be doubled or trebled; and it is far from unlikely that means of fueling at sea (from floating ships), and of towing (non- and semi-rigids at least) from the masts of parent craft or other vessels will be developed. And in good weather, heading into the wind, it should not be difficult to pump fuel from ship to airship.

The reconnaissance referred to would include a patrol of the home coast, search of the enemy's coast (both in conjunction with aeroplanes), and observation of his mobilization movements. Secret service men might march with the unemployed. The dirigible could work out the long search problems—find ships lost to cable and radio on the broad ocean, hunt out the enemy in his secret harbor and bases. A combination of supply ships and dirigibles would make the logistics of scouting as simple as those of a pleasure trip.

It has been demonstrated with German thoroughness that aircraft will supplement, not replace, cavalry; similarly at sea, far from displacing scouts and cruisers, they will serve as a valuable adjunct. The cruiser can keep the sea in weather much too stormy for aircraft, and will be needed at all times for "mothering" seaplanes or dirigibles. Moreover, it may be able to chase and destroy hostile vessels discovered from the air, and to drive off enemy scouts, where the offensive power of aircraft would be insufficient. Scouts must not be sent to the "bone yard"—but fewer will be needed.

Seaplanes and dirigibles—which pertain particularly to the navy—will greatly extend the scouting line (touched on further below). At 3000 feet the airship has a vision of 60 miles; and under ideal conditions, from sufficient height, even 100 miles. Wireless communication from these craft at a range of 350 miles is "an accomplished fact." With scouting lines and radio chains in air, we may be able to trail and report an enemy from the other side of the ocean; while aircraft *closely attending a fleet* can give five to nine hours warning of an approaching foe.

In this latter case the seaplane will be at its best. True, it cannot make independent oversea flights with its smaller radius (hardly over 200 miles each way), and cannot extend its range, like a Mother Cary's chicken, by resting on the waves: but relays of seaplanes constantly in air during daytime can extend the vision of the scouts they base on by some 60 to 100 miles each way, provided wind and sea are moderate. Cruisers, also, venturing beyond their supporting ships can depend on seaplanes for a warning of bigger ships in the offing.

We should particularly emphasize the importance of scouting, by both seaplanes and dirigibles, *from advanced bases*. This might mean much to us in the Caribbean, or from our Pacific islands. Fortified aircraft bases in the Caroline or Marshall Islands may some day be useful to Japan. *Quien sabe?*

As to Screening.—Hostile aircraft will make this almost impossible, unless we have such a mastery of the air that they will not venture near the fleet. Of course, a screen of guns will still be useful to repel torpedo craft and the like: but "the cards will be on the table"; it will be almost impossible to make air "mastery" complete, or to prevent stray aeroplanes from slipping in for a look.

Spotting.—On land, the next great and proved usefulness of aeroplanes has been in spotting (dirigibles are too costly and vulnerable for this use). Though something of this was suspected before, it has taken a war between first-class powers to drive the fact home. We now have to realize that, on land at least, forces without the aeroplane fighting forces with it would be blown to pieces by both artillery and small-arm fire.

At sea, until masts are shot away, we have a portable substitute for hills and trees—hence we have less need for the spotting seaplane: but masts *are* shot away; and even before this, when the target is distant, the seaplane over it will aid in getting a primary range. We begin to realize that a first "lucky salvo" almost decides the day. In the recent battle in the South Pacific, the German ships quickly had the *Monmouth* and *Good Hope* in flames because they got the range first. The reason for this, it appears, was that the British ships were silhouetted against the sunset sky, while their enemies were almost in darkness. A few circling aircraft might have given a range before twilight, or (with luminous signals) have controlled the fire after the target ships

and the splashes of British guns were dim. It is thus important to note that at times, when, owing to darkness or glare, spotting is difficult from the ships, it may be easily managed from an aeroplane; and that at all times, error *in range* can be more exactly determined in this way. Though this use has not yet been tried out in naval warfare, we may confidently expect to hear from it. After the range is found, the control of fire may better be handled from the tops, since communication with aeroplanes might not be reliable: but in the later desperate stages of battle, unharmed machines and people on high might be invaluable. (For the *offensive* from aeroplanes in these later stages, see below.)

Even now, at 8000 yards, would not the humble, handy kite, if properly understood, be a fine adjunct to the more vulnerable mast?

As we see in the papers, land-fire is controlled from aeroplanes by various devices—jets of smoke, smoke-trailing projectiles dropped over a hidden target as a signal for taking the range, cards giving information dropped over the firing battery, etc. At sea, the use of brief radio signals from small aeroplane sets will doubtless be developed; but visual signals can certainly be used.

The extended battle ranges that will follow the use of 14-and 15-inch guns on battleships will make the demand for aeroplanes even greater than it is now. It is certain that future programs of the great nations will include a large provision for *spotting* as well as for *scouting* aircraft.

Offensive Uses.—At sea, offensive aerial warfare is not open to an objection strongly urged on shore—that of being inhumane. All men-o'-war and man-o'-war's men are fair prey for an enemy, and stray bombs fall harmlessly into the ocean.

On an enemy's coast, dirigibles and other aircraft lend themselves particularly to raids, in which the quantity of destruction may be limited, but the quality high. The destruction of a wireless plant or of a dreadnought on the ways may add greatly to the pleasure of a crossing.

The *weapons of the dirigible* are: Several rapid-fire or machine guns, including one on the top platform for overhead fire; automatic rifles; and bombs. The German *Victoria Luise,* for example, is said to have hooks for 12 projectiles weighing 600 kilos each. They hang inside the envelope and drop through

removable shutters. The overhead gun is reached through the usual funnel. The latest Zeppelins, it is rumored, will carry from 30 to 40 "torpedoes" as powerful as those of a 42-centimeter siege gun, and will drop them from a cage suspended 500 yards below the airship.

The aeroplane's weapons are: Revolver, automatic rifle, four or five small projectiles weighing 80 to 90 pounds each. Of course, unusually large machines may carry a ton or more of projectiles, and some aeroplanes have mounted a small gun, which can be fired without unduly disturbing the equilibrium. As noted above, arrows, or "flèches," are also used (against personnel).

Moreover, "It is probable that the size and power of aeroplanes will be enormously increased in the future."[2] Even from ordinary present types, according to expert testimony before the House Military Committee, as much as 500 pounds of high explosive could be dropped without causing an upset (the dropping of a *50-pound* projectile was not noticeable). Big machines like Sikorsky's will carry several tons of projectiles, the explosive power of which will be no mean factor in a battle. In naval warfare, we must constantly remember, both men and machinery are much more concentrated than on land. No captain would really enjoy having a large battling aeroplane overhead.

As to the use of small arms, there are frequent accounts—some imaginative, no doubt—of thrilling fights in the air, and wounded aviators driven to the ground. The British claim an "individual ascendancy" in these contests against the Germans. Apparently their fast biplanes are handier than the Taubes.

All told, though aeroplanes are as yet too useful for reconnaissance to be risked wantonly for any kind of fighting, the time is rapidly coming when large increases in the aerial fleet will permit this offensive use. There is every reason to expect a development like that of the underwater torpedo.

"Heavy, heavy, hangs over thy head!"—the forfeit may be "blood and iron."

The *effectiveness* of aircraft projectiles is a dangerous question, with explosive tendencies. No two experts agree. On the one hand, it is urged that there are too many unknown quantities—wind, speed, etc.: that it is hard to put a machine over a given spot and harder still to tell when it is there; that it is impossible

[2] Annual Report of the Chief Signal Officer of the Army.

to judge by the eye, and that no instrument can be devised to show just when to let go; that gun-fire will force aircraft so high that the target will be a speck—and so on, at great length.

The usual answer is equally full of words. The answer that can be given is: *the thing has been frequently done.*

Statement of Mr. Riley E. Scott before the House Committee on Military Affairs (August 16, 1913).

The Chairman. You were at one time in the army?

Mr. Scott. Yes, sir.

The Chairman. Did you do any duty as an aviator while in the army?

Mr. Scott. No, sir; I took up aviation afterwards. I have made a special study of the aeroplane as an offensive weapon.

The Chairman. We would like to hear what your experience has been.

Mr. Scott. About 1908, when Mr. Wright was making his first flights, I came to the conclusion that the aeroplane would eventually become very important as an offensive weapon. The fact that you can get over an object to be destroyed and that you can see it from an aeroplane better than in any other way caused me to come to the conclusion, with proper application of scientific principles, that bombs or explosives could be dropped accurately, and I took up that study specially.

In 1911 a gentleman in France offered a prize for dropping dummy bombs on a target. The prize was 150,000 francs—half of that was available in 1912 and the other half in 1913. I already had an apparatus designed which, through the courtesy of Gen. Allen, I was able to test at College Park. I took the apparatus over to France and was fortunate enough to win the whole series of prizes. The heights from which the projectiles were dropped were 200 meters (about 656 feet) and 800 meters (about half a mile). Fifteen projectiles were dropped on each flight, the time being 50 minutes. The winning machine was able to place 12 out of the 15 projectiles within a radius of 10 meters—that is 33 feet, which would be a little over twice the size of this room—12 out of 15, each weighing 25 pounds.

The second test was at 800 meters—we really flew at 850, over half a mile, and 12 out of 15 projectiles were placed within a radius of 40 meters, 120 feet square, which is a very small portion of the side of this building.

The various tests made—the meet lasted from March until September and included hundreds of flights—and the accuracy attained, convinced me that projectiles could be dropped with a great deal of accuracy on any target from, say, a height of a mile, from 1000 to 1500 meters, a mile, or a mile and a quarter. I have been studying considerably the application of such a device, which I believe to be sufficiently accurate at the present time, and I firmly believe that the aeroplane will become a very important destructive weapon, much more so than we realize at the present time. It could be used, among other things, in a siege against a besieged place. There is always some key point like there was at Port Arthur and Adrianople, against which troops are fighting sometimes for days and

weeks—against the strongest point—without any appreciable effect. In such a case, if I were the commanding officer, I would send up as many aeroplanes as were available, 20 or 30, each one carrying 500 pounds of high explosive, and rain that high explosive on this important point that they were trying to attack, and just as soon as that was completed, then rush in the troops and storm the fortifications or the strong point, and I believe it would be effective.

The *Marine Rundschau* (December, 1913) states that Herr Friedensburg, using a simple trap-releasing contrivance, from a height of 1312 feet, dropped bombs one yard, and 13 yards, from a target ship; and on land hit the target exactly from a height of 1640 feet.

We have very similar testimony from French and British sources, which it would be tiresome to quote.

It may be argued that practice under fire from blank cartridges is quite different from the real thing in war. Let us remember, however, that for war results:

(a) We do not need 12 out of 15 hits—one will do.

(b) Aerial target practice is the most difficult known.

(c) Many machines are armored.

(d) Aviators as a rule are bold, take chances, and fly low if the risk be justified. A dreadnought is worth the price of several machines.

(e) Some men are as cool under fire as at drill—*vide* Cushing when he sank the *Albemarle* in the blast of an 8-inch gun.

(f) British aviators have recently made hits under heavy fire.

However, a nation may be as cool in the face of statistics as aviators are under fire. Though sentiment among service fliers tends towards the possibilities of offensive work, there is a conservative view that demands attention:

> It may later be shown that aerial offensive flights, especially in conjunction with sea operations may prove important; but it is useless to prophesy, and I believe the only safe conclusion at this time regarding the value of aerial offensive is the verdict "not proven."[3]

It is comforting to think that money is not being thrown away on bubbles; but it would be disconcerting if the bubble, in bursting, turned out to be a bomb.

Successful dropping, we are told, depends upon the following factors: Speed over the ground, height, rate of wind, relative

[3] Report of the Chief Signal Officer of the Army.

direction of wind, drift of machine, and resistance of the air. Of these, height, direction of wind, and rate of wind (knowing the rated speed of the machine) can be measured with some accuracy. An aviator provided with barometer, compass, anemometer, and reference card with tables, who knows the speed of his machine and estimates or measures his inclination to the horizontal, ought with practice to adjust his "director" and release his projectile with good chance of hitting a large target like a fort or a battleship. It may be that with long practice he will achieve good results without instruments, from moderate heights. Close-to he might well hit a Zeppelin or a submarine. The "kick" from the effects of an explosive dropped from heights of 1000 feet or less has been referred to as a menace: but at the instant of release the ship soars upward and the machine travels faster, so that this danger has not resulted in reported casualties.

An instrument has been devised, but not adopted by the British government, to which it was offered, that partly eliminates one source of error by giving the projectile a reverse velocity exactly equal to the ahead velocity of the machine, so that, instead of dropping before the overhead position is reached, the aviator can drop at (or almost at) this vertical position.

Added speed to the projectile would diminish errors. From a French biplane at Bisley a Lewis machine gun hit a 30-foot target 11 out of 14 times at a height of 500 feet. Colonel Jackson, in the *Journal of the Royal United Service Institution*, says:

Bomb dropping will soon give place to bomb shooting.

Let us now take up the different uses of bombs more in detail, realizing that this phase of aerial warfare is still a matter for speculation, and that we must make out a case strong enough to warrant expenditure and experiment. Some of our ablest *non-fliers* see few offensive possibilities for aircraft. In the present writer's opinion—influenced by the practice of the leading air powers—the airship bomb and its accompanying devices will be developed just as were the telescopic sight and the 42-centimeter siege gun. Can we afford to neglect it singly even as a *military possibility?*

(1) *Use of Projectiles against Forts, Canals, Public Buildings, Oil Tanks, Sheds, etc.*

As yet, in the present war, the full power of Zeppelins against military and other public works has not been tested. Where siege artillery is at hand, the dirigible is not needed. Its effectiveness may be better shown (as already said) by *raids* across hostile territory or across channels commanded by the enemy. Those against Antwerp merely suggest what might have happened with more ships and greater skill (both of which are inevitable), later in this war or in the next war. A bomb *on*, instead of *near*, the Royal Palace at Antwerp would have opened eyes to the powers of the dirigible—might have resulted in a clamorous search for our lone ship of ancient model. It is easy to imagine that the bomb that beheaded an old woman might have exploded a magazine. This much was demonstrated: that projectiles can be dropped, with some degree of accuracy, even at night from a ship under fire, and will produce large explosive results.

It is evident, however, that the Germans are *withholding* their Zeppelins, and have not yet put them to the test. They flatly deny the French claim that seven dirigibles have been destroyed, and still have (admittedly) more than any other nation. It is unreasonable to suspect that so logical and enterprising a people as the Germans have discarded one of their pet instruments almost without a trial. Though the French also have dirigibles, the completion of their rigids had been much delayed, and at the outbreak of the war they had (with one exception) only scouting ships; while the British airship strength lay chiefly in "futures." Thus we cannot yet (December 15, 1914) judge by results in war.

Although bomb dropping pertains more to the dirigible, The Allies have three times shown that the offensive power of *aeroplanes* must not be despised.

On September 23, 1914, a squadron of five British machines flew well over 100 miles into German territory and dropped bombs on Düsseldorf and Cologne. At Düsseldorf they damaged a Zeppelin shed and its airship, and a machine shop nearby. They were not expected and were not damaged by the few shots fired at them.

A second raid was made by three machines, over the same cities, on October 8. One aviator descended to 500 feet and dropped two bombs on the Zeppelin shed at Düsseldorf. Though received

with heavy fire from anti-aircraft guns and rifles, he hit the shed (it is officially reported) and blew up one airship, possibly two. A bullet passed through his cap, another cut one of his twin elevator control wires: but he escaped, as did his companions.

On November 21, three (or four) aeroplanes appeared over Friedrichshafen. Having been sighted at various points along the Swiss-German frontier, they were warmly received.

Immediately the aeroplanes were sighted over Lake Constance a storm of shrapnel and other shots burst around them from guns and mitrailleuses at Friedrichshafen, and from gun boats of the German lake flotilla. Guns at Constance, Meerburg, and Immenstaad also joined in the bombardment. One machine was hit several times, and the aviator was obliged to plane down in spiral curves, with his motor shut off. The aeroplane itself was not greatly damaged, but the pilot was taken to the hospital with severe wounds on the head.[4]

Accounts differ as to the height of the aviators and the damage done: but it is clear that they dipped to about 1200 feet and escaped destruction, though the enemy had been ready and waiting. The First Lord of the British Admiralty reported to Parliament that a shed had been hit and badly damaged: the Germans deny this! In the raid The Allies pierced 125 miles into German territory.

The German aeroplane raids over Paris and over Belgian cities may be dismissed as of no military importance.

In view of what has already been done, the present writer cannot doubt that aircraft bombs are a grave menace to particular structures.

Let us hear Mr. Riley Scott again. His remarks are said to have made a deep impression on the Military Committee:

My particular hobby, the thing I have been studying about particularly, is the destruction of the Panama Canal. It has cost an immense amount of money. It is a lock canal, and there has been a great deal of discussion as to whether certain parts will hold up. . . . . In war the object of the foreign nation is to destroy our greatest strategic point, which would be the Panama Canal, and they would put all their force against the Canal. For some reason our fleet is not there, it has been defeated or it is protecting some other part of the coast—any way, they go there. No matter how strongly the Canal is fortified, they do not come within range of the guns; they cruise out 20 or 30 miles. The distance to Gatun Dam or to the locks would be probably half an hour's fly. They send out their aeroplanes loaded with high explosives, say 20 or 30 of them, as many as they can send, hoping that some of them will get back; but in warfare we take

[4] *New York Times.*

chances, and if they destroyed the Canal no doubt they would be willing to lose them all. They send them up and they are flying one after another, placing 500 pounds of nitrogelatin first on the spillway and later up the Culebra Cut, causing slides. I think some of you gentlemen know the effect of an explosive on the earth, causing it to slide. I think the Canal would be put out of business, probably in one hour or two hours, by an enemy with aeroplanes. That is, of course, my personal opinion. We do not know the effect of an explosive dropped from an aeroplane, because it has never been done except in a small way. I firmly believe when the experiments are carried on in that direction that it will be found to be very destructive.

Mr. Scott's testimony was supported by that of several army aviators. Captain Mitchell, when asked,

Do you think in course of time that the military by experience will be able to drop bombs with any accuracy?

answered:

Yes, sir; probably with great accuracy, but the effect would be the same as a high explosive shell. We do not use that against personnel; we only use it against matériel—houses, buildings, etc.—because the effect is local.

Lieutenant Arnold called attention to damage inflicted by bombs during the Balkan War.

Could not the ship that hovered over Antwerp by night have dropped the same bombs over the Canal by day? We must look forward to the time when the radius of European dirigibles, towed, "mothered," *or unaided*, will extend to American shores: also remembering that Mexico is convenient, and could not now enforce her neutrality against an aggressive enemy of ours.

Had Great Britain waked up sooner to the need of first-class dirigibles (she is *wide*-awake now), she might have "doubled her sea-going fleet" by raiding and blocking the Kiel Canal. She might also have reached and greatly damaged the German dockyards. Would the Kaiser's War Machine have turned, as if by the pressing of a button, had a timely Zeppelin bomb fallen on the War Office or amid the portfolios of the General Staff? System is largely dependent on charts, drawers, desks, and perishable records.

Let us admit, again, that in this discussion of bomb dropping we have discounted the future and ventured beyond sure ground. To some minds the whole matter seems fanciful. Yet there are mutterings from the sky: the danger must be at least disproved. If airships cannot rival batteries in hits per minute, they may reach vital spots denied to "Busy Berthas."

(2) *Incendiary Attacks on Cities*

London is the "heart of England." Its destruction could not be made light of as a military trifle. With a sufficient fleet of airships an enemy could set fire to London, *with incendiary bombs,* in 20 places at once—and then 20 more! Hence the anti-aircraft guns on high buildings; the searchlights about the darkened city; the screened lights of Buckingham Palace; the drawn curtains of railway cars; the nightly aeroplane patrol.

The danger of German Zeppelin raids on London was known, the alarm sounded by high military authority, even before the war. With their 20 or 30 Zeppelins, still more with a great fleet of aeroplanes from a base sufficiently near, the enemy could not only destroy individual public buildings, but also could start "a conflagration that no fire department could cope with"—could "Set the Thames on fire!" The idea of doing this is said to be a real obsession with the German people. Perhaps their rulers prefer starting the blaze with the British fleet.

(3) *Attacks on Fleets—at Anchor, in Bases, under Fire in Action*

As yet there is no record of a warship destroyed by aerial bombs, though a Mexican aviator missed a Federal gun boat by only a few feet. Since the earliest days of the airship, men have wrangled over this point.

We have seen what Mr. Scott did from a height of 2600 feet. At this height an aeroplane would be under fire, though not an easy mark. From a mile (5280 feet), Mr. Scott thinks he could make "50 per cent of hits." At this height, it is said, an aeroplane is practically invisible, so that the aviator's nerves would not prevent good practice. Considering the immense size of a dreadnought and its limited defence as compared with that of the Zeppelin shed at Düsseldorf (see before), we are forced to the conclusion that a squadron of skilled aviators, if persistent, could make hits without the exposure incident to a torpedo attack. Still more could hits be made from the hovering Zeppelin.

Now we come to the real difficulty: Would these hits be effective? Unfortunately the tender part of a ship is under water, and the airship cannot throw curves. Some contend that a projectile, bursting on the upper deck, would not pierce the protective deck or reach the vitals of the ship. Probable injury

to the personnel has been spoken of as small, and to the guns (curved, for a glancing blow) as negligible.

But can we consider with equanimity having a 500- or 1000-pound nitrogelatin bomb from a big aeroplane—or the still huger projectile from a Zeppelin—explode fairly on the deck of the *Pennsylvania?* Would not guns be dismounted, turrets, conning towers wrecked, decks set on fire?

It seems to the present writer that not enough attention has been paid to the effects of such a disaster in the *latter stages of an engagement* when, it may be fairly said, aerial guns would be abandoned, and aeroplanes, even dirigibles, could fly low. What a chance for a decisive hit, or the *coup de grace* to a stubborn foe!

Suppose, moreover, we turn the trick of putting one shot through another's hole. Impossible? Not at all. We need only suspend from our releasing device two projectiles, one hanging from the other, with say, 50 fathoms of chain between. The first goes crashing through the upper deck, the second follows in its wake an instant later, and explodes in a magazine or among the boilers. If experience shows that one, in bursting, detonates the other, let the first be solid or fused for time. Of course, experiment alone could indicate whether such ideas have value.

Another plan conceived is to drop an actual torpedo, breaking its fall by a parachute, so that it will strike the water close-to and near the target ship. In place of a water tripper, an underbody device would be supplied to operate the engine at the instant of impact on water. It has also been proposed to fire long-range torpedoes from a car close to the water beyond the zone of effective gun-fire.

These problems of the air, all so new to us, overtax a sea-going imagination. Let the inventive spirits that have given us the gyroscopic compass or the torsion meter devote themselves to the solution, and find a way—along the lines suggested, or along some other. If the Germans can (as reported) suspend a cage 500 to 1000 yards below a dirigible, could they not, unseen in the darkness, lower an automobile torpedo into the water near a ship at anchor?

It has been noted that the glow from the funnels of a ship with steam up would make a target for night work, even if the ship itself were screened.

There is a widespread belief that the heart of the Hun is fixed on raiding that terrible "fleet in being" that is winning a silent victory for The Allies. It remains to be seen whether the "high sea fleet," with its submarines, will be joined in the attempt by the assembled Zeppelins.

(4) *Aircraft and Commerce*

In the conditions predicted for the near future, aircraft should be able to pick up hostile commerce with great facility; and having found unarmed merchantmen, to capture or destroy them with equal ease. This has not been tested (so far as we know) in the present war, there have been too many other calls. As range and numbers of aeroplanes increase, we may expect to hear of this new kind of "piracy," corresponding to the attack on merchant ships by submarines (which has already begun). In both cases it will be impossible to save the passengers and crew, except by letting them take to their boats; and with the aeroplane there will be the added difficulty of establishing communication. But scruples will not cause the neglect of any such means of harming an enemy. In practice, aircraft might better prey on commerce in conjunction with scouts and cruisers.

The *protection* of merchantmen (and of other convoys) will be another duty of aeroplanes and dirigibles. By warning the convoy of hostile ships drawing near, and by summoning the patrol when necessary, they can greatly aid friendly shipping, neutral colliers in friendly service, transports, and other helpless craft. They will also, of course, attack the enemy's fighting aircraft.

THE TACTICS OF THE AIR

Since aircraft are as yet too valuable and too much needed in reconnaissance and spotting to be readily used elsewhere, we may expect that a belligerent will, if possible, use *guns* rather than his own aeroplanes to destroy the enemy's. Just as, on water, pitched battles between torpedo flotillas will be rare so long as opposing battleships can be reached, so in air, suicidal mêlées will be avoided. Of course, the "mastery of the air" and the "individual ascendancy" are of great importance, and there will be (as there have been) many individual running fights between aviators. Machines will chase enemy machines crossing their lines or dropping bombs from beyond the reach of guns. But

aeroplane squadrons are still small, and battles are mostly "single machine actions."

The offensive against *dirigibles* will, on the contrary, be a highly important function of aeroplanes. A non-rigid (or even a Zeppelin) attacked by a squadron of winged fliers will be hard pressed. Her machine guns will have heavy weather accounting for a number of "torpedo aircraft" dashing in simultaneously from different directions, especially from overhead. Though the airship can climb faster, some aeroplanes may well be higher at the start, and from a safe height may drop bombs on the huge bag of potential flames below. The fighting aeroplane will carry a gun of its own, and will be a far more difficult mark than its bulky antagonist—also with the advantage of speed. There will be no escaping these mosquitoes. In desperate fights, ramming by aeroplanes will be resorted to, with fatal results to both sides—unless some device like the explosive trailer (already referred to) be substituted. "Brassey" points out that even a trailing tail of barbed wire could rip a non-rigid to pieces. An aeroplane in position to ram might increase its own chances by passing just over and dropping (or shooting) a projectile with certain effect. Some form of aerial "spar torpedo" or envelope-cutter at close quarters will probably be tried. Against the less vulnerable Zeppelin, incendiary bombs will be effective. To lessen this danger, it has been proposed to have a non-inflammable gas (like the exhaust from the engines) fill the "ring space" between envelope and balloonettes. The necessity of carrying low pressures in this type greatly reduces the menace from rents and holes.

A *defensive screen* of aeroplanes will, it seems clear, attend a dirigible to head off most of the attacking aeroplanes, leaving only a few nimble craft for the dirigible's guns.

We thus conclude that when aerial tactics crystallize, *groups of aeroplanes will attack dirigibles screened by friendly groups.* But the best course for the dirigible is to lose itself in space: to avoid the aeroplane's zone by day, and to prowl by night, when hunting an airship, will be like "looking in a dark room for a black cat that is not there."

Though aeroplanes have been grouped into "flights" or "squadrons"—the first United States squadron has eight aeroplanes—there seems so far to be no *tactical* unit for aircraft. The

following " strategical " unit is proposed in " Jane's Fighting Airships, 1913 ":

(a) Offensive dirigibles with bombs.

(b) Mother dirigibles for aeroplanes.

(c) A number of war aeroplanes especially for fighting other aeroplanes or attacking dirigibles.

(d) A few swift one-man aeroplanes for eyes.

It is impossible in the elementary state of air tactics to say what force will correspond to the tactical division or squadron at sea. So far, where machines have flown together, their action seems to have been individual.

Similarly, battle formations, analogous to " line," " column," etc., are very much " in the air." A *hemispherical* formation would seem appropriate for attacking dirigibles, the maneuver being to " cap " the airship and attack from all directions. Perhaps a " V " in three dimensions would be better! The characteristic feature of such formations is, of course, that they will not be in one horizontal plane, like the sea. We must defer further discussion of these until the aerial game-board has been put in commission. The fundamental principles of torpedo-boat warfare should apply.[5]

(5) *Aircraft in Relation to Submarine and Torpedo-boat Warfare*

An important function of aircraft will be to guide submarines and destroyers to their prey.

Defensively, they will warn friendly ships of the presence of such craft. In action they may give warning of an imminent torpedo attack.

On scouting and patrol duty they will be invaluable (through their greater radius of action) in permitting ship's crews, racked by watching, to rest. Their outer line of scouting will be a great comfort in torpedo water. They will also aid destroyers and submarines by eliminating certain hours of search.

In smooth water the aviators can detect a submarine when submerged—even " 40 or 50 feet beneath the surface "—just as our airmen at Vera Cruz found sunken obstructions that had long eluded other search. When looking for these boats or their peri-

[5] The " weather gauge " will be the overhead position; but the direction of the wind will vitally affect *speed*.

scopes, aircraft will be able to fly low, having nothing to fear. After finding a submarine, they will drop mines on it from a convenient height, unless the boat porpoises and unmasks an aerial gun. At present, the contest between the two foes of the battleship seems a one-sided affair.

(6) *Other Uses*

Among various other uses of aircraft may be mentioned:

(a) Carrying messages.

Under certain circumstances—as when the enemy are "jamming" the radio—seaplanes or other aircraft may render invaluable service by carrying messages.

(b) Transporting passengers.

Not only may they carry an admiral's messenger or aide, but they may transport the commander-in-chief *himself* from one scene of operations to another not too distant. The future Commodore Perry may change flagships in this manner. In fact the seaplane may settle the much-vexed question as to the proper post of the commander-in-chief in action!—a suggestion advanced with all due modesty and diffidence.

(c) Protection from mines.

Not only will the aviator have a good chance of sighting the hostile mine-layer at work: he will also discover submerged mines already laid, and perhaps, "Brassey" thinks, may explode those sighted by dropping bombs near them.

(d) With expeditions ashore.

In inaccessible regions, scouting seaplanes may greatly lessen the dangers of landing parties and expeditions inland by unmasking batteries and large bodies of troops concealed from the naval force. With a seaplane to warn of Mataafa's massed warriors, the Samoan disaster might have been averted. In early Philippine days, aircraft would have been invaluable. Their use with large marine detachments pertains rather to army warfare.

Reference is made elsewhere to the cooperation of dirigibles and parent ships and to the transportation of seaplanes on battleships and scouts.

The surprise of the European War (to the man up a tree) has been the immense part played by aeroplanes. So far their rôle has been reconnaissance and fire control: but it is inevitable that air armaments will grow: and with this growth will assume the

various duties touched on here, as well as others. Let those who laugh at the long-range offensive by aeroplanes and dirigibles remember how fine it was 10 years ago to work 100 miles by radio. In 1807 the steamboat was known as "Fulton's Folly."

IV. PROTECTION AGAINST AIRCRAFT

To complete the discussion of what aircraft can do, we must see what can be done against them.

We have noted that the attack of hostile aeroplanes, still more of dirigibles, may be driven off by aeroplanes. But "it is not sufficient to depend on aircraft to deal with hostile aircraft"—nor is it economical. If we can destroy the enemy's eyes without losing our own, so much the better.

This brings us to the aerial gun, with which future battleships must be equipped. It may well happen that no friendly aircraft will be available against attack, and guns will be the only reliance.

Such guns would be portable, with mounts on the forecastle, on the superstructure, on turrets, or in the cage mast tops: preferably in various places, the necessary condition being a clear view for high-angle fire. Some must be in easy reach for quick work, with ammunition, in war times, always at hand. The following would be among the characteristics for a "cloud chaser":*

(a) Should have a caliber of about 2 inches.

(b) Should be capable of 80° to 90° elevation, and a train of 45° each way (from a *fixed* platform it is not safe to fire vertically upwards).

(c) Should be rapid-firing guns, with fixed ammunition and high muzzle velocity.

(d) Should have automatic sights, so that the gun-pointer, seated, could follow at all angles of elevation.

(e) Should have a rapid (automatic) fuse setter.

(f) Should fire a shell that would offer little air resistance, and will "break up small" (to avoid injuring friends).

It has also been suggested that a certain danger zone should be selected, the arcs of which will be covered by the various anti-aircraft guns—so that aircraft crossing it will probably be hit.

Several types of anti-aircraft shell have been devised. One

* See "Duncan Commended Essay," 1914 (*Journal of the Royal Artillery*, October).

has in its base a mass of incendiary material which leaves a trail of smoke useful for spotting, and a sensitive fuse that will burst upon impact with a wire or even with the envelope of a dirigible. Another, of the high-explosive shrapnel type, combines the advantages of the shell and of shrapnel by having a head which is itself a high-explosive shell. There is a considerable interval between the bursting of the shrapnel body and that of the explosive head, with two chances of piercing an envelope. Either part would ignite the gas of a dirigible.[7]

The great stumbling block to the successful attack of aircraft by artillery is the difficulty of distinguishing friend from foe.[8]

At sea this difficulty may be lessened by the descent of hostile craft for good practice with a relatively small target—say, at present, to 1200 to 2500 feet (taking some chances), at which distance, with known characteristics and recognition signals, a *friend* would be recognized.

Searchlights would be used, as on shore; and in case of ships coasting or at anchor, radio communication would be established with lookout stations on hills or high structures. Lookouts might also be stationed by the guns aloft. At night, underway, lights would be screened if attack were threatened, and the give-away searchlight would not be used for *searching*. Absolute quiet would be important, for the whirring of unmuffled engines can be heard a long way; while, on the other hand, in still weather, talking below is audible on a dirigible (with engines stopped) 4000 feet up.

It is a safe guess that transports, submarines, and other vessels, will carry high-angle fire guns. Every ship will need a large and convenient supply of rifles to use against low-fliers with projectiles, though the use of armored aeroplanes and cars, and possibly of hanging cars, will render rifles of doubtful utility. Small holes will not wreck a Zeppelin or even a Parseval, but a number will send it back to its base.

Overhead wire netting, it has been suggested, will protect ships (and magazines ashore) from the effect of explosive projectiles. Where practicable, two nets, sufficiently separated, would be better, if not unduly troublesome. H. B. M. S. *Iron Duke* is said to be "specially protected from aerial attack."

[7] See *Scientific American*, December 5, 1914, pp. 453 and 480.

[8] "Duncan" Essay, *ante*.

Finally, as to the effectiveness of the "torpedo defence" of a dirigible:

> The Zeppelins, the Schütte-Lanz, the latest Astra-Torres, Lebaudy, Clement-Bayard, Parseval, and other types have armored carriages and carry guns. The carriages are so placed that expert gunners can shoot in every direction except straight up, and this direction is taken care of by gunners on top of the gas bag, who reach this position by a ladder that goes through an opening from bottom to top of the gas bag. What a dirigible can do to a slow aeroplane can be judged from the results of experimental shooting at moving targets conducted in the last 18 months. In an experiment with the army Zeppelin *Z-5*, just before the war, the following maneuvers took place:
>
> A box 30 feet long, 15 feet high, and 18 feet wide was suspended from a balloon at a height of 1000 meters (3280 feet).
>
> The wind was strong and moved the box, so the difficulty of hitting it was little less than hitting an aeroplane. The dirigible circled around the balloon, and fired at 4000 feet distance, first 50 cartridges with a machine gun, then with a cannon. The balloon was then pulled down and they found that almost all the bullets had struck. The balloon was sent back to an altitude of 1200 feet, the dirigible went up to a height of 2200 feet and fired 15 cannon shots from a distance of 6000 feet. Two-thirds of the shots were effective, three striking the black spots which represented the pilot and motor. The maneuver was repeated at a distance of 7000 feet with the same results.[9]

V. SPECIAL APPLICATIONS OF AIRCRAFT TO OUR OWN NAVAL WARFARE

Following the above discussion of the aerial arm and its application to naval warfare in general, we may consider some special applications to our own case.

In the Atlantic we must expect (in case of war) long oversea expeditions directed at our own coasts, the Caribbean, or the Panama Canal. Foreknowledge of the direction of movement, strength, exact location of our enemies, will affect our strategy profoundly. Heretofore we have had to expect news of hostile sailings west, northwest, or south, followed by impenetrable silence and mystery, with an enemy lost on the ocean. All sorts of combinations might be taking place while our few scouts were groping; or forces last heard of together might be stealing upon us at different points. All our plans for scouting, radio chains, steaming to meet the foe in midocean, have been liable to miscarriage from lack of information.

[9] *Flying*, December, 1914: "The War in the Air."

Distant reconnaissance will reverse all this.

We have reason to believe that the dirigible with its mother ship, or the scout plus its seaplanes, or the armored seaplane-bearing cruiser, will disclose the distant movements of any enemy, unless his aircraft drive ours home. Particularly will we need the dirigible. Experience alone will tell how long flights it may undertake in the face of possible bad weather. The fate of the German *L-2*, wrecked in a gale at sea, is fresh in our minds. The Germans, who have developed the dirigible, have so far been more interested in flights across the North Sea than across the broad Atlantic. But we must remember that, except in the hurricane season, a southern route, with fair weather or favoring trades, would be open to aircraft: and it is fair to suppose that, in the natural course of evolution, dirigibles will be able to keep going in all weathers, or at least to hold their own, or to run away from the widest northern storms. But speculation aside, it is an established fact that dirigibles can make flights in excess of 500 miles and return, that would be of great importance in scouting operations based on our eastern coast or a point in the Caribbean.

As to the seaplane based on a ship, we may speak with equal confidence. It has been demonstrated that a scout cruiser with a seaplane on each side covers vastly more ocean than a cruiser alone. Some figures are given below. In a gale of wind the machine can remain snugly aboard, and the scout-seaplane combination can remain out as long as logistics permit.

In connection with scouting by aircraft, we must give due weight, not only to their range of vision, but also to their speed—varying from 35 miles an hour for slow dirigibles to 100 miles or more for fast aeroplanes. As compared with a ship, this increases the amount of water covered during a given period of scouting in the ratio of from 2 to 8.

Let us fix attention for a moment on a case that has been suggested—that of a hostile oversea expedition advancing against us, while numerous neutral colliers are bringing coal for the enemy's use at a base to be seized by his advanced force.

He might choose as the safest plan that of letting these colliers slip across, one by one, following divergent routes—believing that if they come in a body or in groups we have sufficient available forces to capture them.

Under present conditions, his chances of success would be excellent. Our few scouts and cruisers—eliminating those needed to scout for his main body—would pick up a few unlucky units, involving some loss to the enemy: but would be too few to discover all, or the majority of the colliers. Enough would arrive—if he has provided a margin—to ensure the success of his plan.

Now if we had a few dirigibles and, say, 50 seaplanes transported on scouts or cruisers, we could, without neglecting his main body, so curry the ocean that hardly a collier would escape. A scout cruising alone would cover, against single ships, a front of about 20 miles. If the same scout had constantly by day, on each side, a seaplane about 60 miles away (so that any intervening ship would be visible from 3000 feet up), the scout, with its attendants, would cover a daytime front of $2 \times (2 \times 60)$, or 240 miles—instead of 20! This would involve the use of, say, five planes—two on each side, relieving each other, and one in reserve. We could outfit 10 scouts in this manner with a total frontage of 2400 miles! Allowing liberally for haze, etc., we could surely count on 1200 miles, enough to cover all probable cases.

Meanwhile the dirigibles would be tracking his main body.

A collier, once picked up, could be captured by the mother ship. Otherwise, a seaplane with projectiles could force the crew into their boats (as submarines have done), and sink the ship. Presumably they would avoid this, if practicable, from motives of humanity and of policy.

Any study of operations in the Atlantic clearly shows that one of our big problems will be to find and intercept *convoys;* whether of supplies or of troops. Aircraft will solve it for us. Before risking his troops, the enemy would need command of air as well as sea, for a transport would be helpless against a persistent fighting dirigible.

As said before, we cannot pass on the war-test of the dirigible until we see what the Germans are waiting to do.

We may also need aircraft defensively to aid in convoying our own troops to advanced bases. In this case they would have to drive off many enemy aircraft and, if possible, to sink or drive away their cruisers. They could summon aid for threatened transports, or warn these as to danger zones to be avoided.

The mastery of the air will be vital to us in connection with convoys.

We have seen what may happen to the Panama Canal. An enterprising foe will surely attack it. Our best defence against aircraft will be our own, permanently based (like the submarines) on the Isthmus. Moreover, the presence of the submarine-pilot will make our mobile defence effective against his dreadnoughts.

In the Pacific our use of aircraft will be much the same, but more defensive. We shall need protection for our chain of bases and for convoys to them. At present, the only power that might threaten us in that ocean is relatively weak in aircraft, but not weaker than we are. We need strong aeroplane stations at San Diego, San Francisco, Seattle; and at Honolulu, Guam, and Manila. For the long stretches between, we must have scouting dirigibles. Japan, it may be noted, has one Parseval, and another ordered.

VI. THE PRESENT POSITION OF AERONAUTICS ABROAD

Colonel Sykes of the British Army, in April, 1914, wrote:

> In the European campaign of tomorrow, aerial supremacy will probably prove to be the dominant factor. That supremacy will be gained in peace. The term "aerial supremacy" is not, as is inferred by large sections of the press and by the man in the street, synonymous with numerical superiority in aircraft. The fact that military aviation means a combination of organization, training, and matériel, is often overlooked.[39]

As this passage indicates, aeronautics are not regarded lightly abroad. Though as yet they have been developed as *accessory* to the army and the navy, no man can say that in ten years we may not speak of the army, navy and air fleet as coordinate branches of the fighting establishment. Already in the army we sometimes hear of the aviation corps as a fourth arm of that branch.

Since the war began in Europe, we have been in darkness as to changes in aircraft and organization. We know that great changes *have* taken place: but without exact sources of information, we must base our detailed statements as to foreign air fleets on records up to 1914. Since then we only know, in general, that the great powers involved have lost some ships, have doubtless built others, and are developing aeronautics by leaps and bounds.

"Brassey" sums up aeronautical progress in 1913 somewhat as follows:

> (a) Steady by all important countries.
>
> (b) Most noteworthy advances made by Germany, which is now in the front rank with aeroplanes as well as dirigibles.

[39] *The Quarterly Review:* "Aircraft in War."

(c) Great Britain still leading in seaplanes.
(d) Efforts making to secure less vulnerable non-rigids by subdividing.[11]
(e) Growing anxiety to get airships to sea.

As to the order of the air powers, France and Germany lead, with the latest indications favoring Germany; Russia was next, then Italy, then Great Britain (which by this time may claim a higher place), with Austria sixth. Belgium, Servia, and other nations follow—and somewhere at the other end, the United States marches with Mexico, China, and Dahomey! Germany not only leads in dirigibles, but also has a large number of aeroplanes. Undoubtedly her organization is thorough in aeronautics as in everything else. The papers have been full of German machines; sometimes scouting, sometimes over cities, always like buzzards, over a battlefield. Russia is the "dark Pegasus" of the air. We know that her air power is big and mysterious, and that her aeroplanes are the largest made. She has taken an advanced position in closing "her air" to foreign fliers. France made a strong bid for aerial supremacy, hoping thus to neutralize Germany's military superiority, but is now closely rivaled by other nations. Great Britain's airfleet, though numerically small, seems to be excellent in personnel and organization. We have noted her claims to aerial ascendancy. The cables are warm with reports of slow Taubes brought to the ground by British biplanes. Be this as it may, the undoubted usefulness of British aviators in this war is especially interesting to us, because three years ago great Britain was almost as far behind in the air game as we are now.

Sir John French said in one of his earlier reports:

> One of the features of the campaign on our side has been the success of the Royal Flying Corps. In regard to the collection of information it is impossible either to award too much praise to our aviators for the way they have carried out their duties, or to overestimate the value of the intelligence collected, more especially during the recent advance.

Before considering our own assets and needs, we may take a more detailed view of European progress. With the kaleidoscopic changes of war, exact figures would be useless as well as impossible. The objective is a general idea of the efforts making by each of the major powers. The numbers given are conservative, and probably too small for present strength.[12]

[11] Some are divided into three compartments, with steel bulkheads to localize damage.

[12] The figures below are based chiefly upon those in the 1914 "Brassey" modified by recent statements in the *Scientific American*. They refer to the months just preceding the war. *See later estimates beyond.*

GERMAN AIRCRAFT

Undeterred by the tragic fate of the Zeppelin *L-1* and *L-2* (one wrecked, the other burned in mid-air), the Germans at once ordered two Zeppelins and one Schütte-Lanz of the largest size which are probably now in use. The army controls all the dirigibles referred to below, except the three large ones just referred to and five others privately owned.

To show what a dirigible can do, it is asserted that the private ship *Victoria Luise* made its 400th trip in November, 1913, after covering 29,430 miles, with 21 passengers on each trip.

The following summarizes the German strength at the time indicated:

1. Dirigibles:

(a) Rigid (Zeppelin, Schütte-Lanz) (the largest of 32 tons)	16
(b) Non-rigid (Parseval)	7
Total	23

2. Sheds: Owing to difficulties in getting airships out and in with cross winds, German sheds are now being made of a revolving type. Many sheds have been erected at suitable points.
3. Seaplanes and Stations: Germany has about 50 seaplanes. Stations have been established at Putzig, Kiel, Wilhelmshaven, Heligoland; also at Kiaochau and in Southwest Africa.
4. Aeroplanes: Germany has at least 500 good military aeroplanes, perhaps 1000. Some are fitted with automatic stabilizers. She has standardized her monoplanes (Taubes) and her biplanes (Arrows), with corresponding interchangeability of parts and increase of efficiency.

Newspaper articles of doubtful reliability make the fleet of Zeppelins "intended for London" much more imposing, from 30 to 40 at present. Doubtless the number has been steadily increasing, in spite of the casualties claimed by The Allies. A recent dispatch [13] states that 1000 workmen are now busy at the Zeppelin factory on Lake Constance, and that ships are assembled at Friedrichshafen in three weeks. The *King Zeppelin* is said to have sailed away on November 5 with 50 enormous bombs; seven

[13] *Washington Post*, December 13, 1914.

dreadnought rigids are said to have been launched in August, September, and October—"marine airships" with planes for landing on water. Of the "London Line" 12 are reported ready, with plans for 18 early next year.

FRENCH AIRCRAFT

The French were the pioneers. They fixed their hopes on the aeroplane, as (earlier) on the submarine. In numbers they became first, though their machines are said to be heterogeneous, with many unsuitable for war. Later, growing uneasy over Germany's dirigibles, they built a large fleet of non-rigids. They also made plans for rigid ships, but fulfilment has been slow. Their Astra non-rigid of 38 tons seems to be the largest ship afloat. They developed the non-rigid type while Germany was perfecting the Zeppelin. Some later Astra non-rigids are divided into 12 compartments. The Astra-Torres ships (of "ace of clubs" section) have "remarkable speed and elegance of design." In general, French dirigibles are smaller, less homogeneous, and much slower than the German.

1. Dirigibles.

(a) Rigid (Speiss) (of 20 tons)	1
(b) Non-rigid (Zodiac, Astra, Lebaudy, etc.)	14
(c) Semi-rigid	3
Total	18

2. Sheds: 22 (of the old stationary type). Many are too small for use. Eight others projected.
3. Seaplanes and Stations: Their seaplanes are said to be chiefly of a converted type. Several stations on the Mediterranean, and "the hangar ship *Foudre*."
4. Aeroplanes: 500 to 1000 (or more) effective military machines. Diverse in type. A French airman (Garros) made a flight of over 500 miles across the Mediterranean at a rate of 62 m. p. h. Another Frenchman is said to have flown 650 miles.

The French organization is certainly good, and results in maneuvers have been gratifying. In his discussion of recent maneuvers, General Pau said to the aviators on his side:[14]

Je viens de vous féliciter tout individuellement, mais je vais vous remercier tous en corps des qualités et du dévouement dont vous avez fait

[14] *Les Archives Militaires*, Octobre-Décembre, 1913, p. 396.

preuve, et des services que vous nous avez rendus, je veux dire que vous avez rendus à l'armée dont j'étais le chef. Grâce à vous, heure par heure, et dès le matin, nous avons su ce que faisait l'ennemi. Vos reseignements ont été nombreux, rapides; ils ont été mieux encore, ils ont été exacts. J'avoue que je les ai fait controler par la suite, tout en m'en servant sur le moment.

His only criticism is that though he thus knew the *enemy's* movements, he often had no information as to whether *his own* orders had been executed. He wants aviators to report on this also.

RUSSIAN AIRCRAFT

A discussion of Russia's air fleet is largely guesswork. Her budgets have been next to those of Germany and France: her air strength must be great. Newspaper reports of the war have contained few items regarding her aircraft.

1. Dirigibles: The *Astra XIII,* built in 1913, makes only 35 miles per hour, and is non-rigid. "Brassey" refers to 12 other small craft built, only six large enough for war use.

   Three ships are building in Russia and two are ordered from France.

   Total built—13.

2. Sheds: Eight in European Russia (good sized), mostly double; two at Vladivostock, two others projected.

3. Seaplanes and Stations: Russia has 24 or more Curtiss seaplanes, and a number of French. Sikorsky has made giant machines of this type with four 100 H. P. motors each. Army has no seaplanes.

4. Aeroplanes: The big machines of Sikorsky are too slow for most military uses. Russia has a large number of aeroplanes —authorities say 200 to 500; a matter of guesswork.

ITALIAN AIRCRAFT

Italy had war experience with aeroplanes against Tripoli, and made great use of aerial photography.

1. Dirigibles:

   (a) Rigid: Three large ships (32 tons) said to be projected.

   (b) Non-rigid: (Chiefly small.) One of these for naval use 9

   (c) Semi-rigid: One built (Forlanini), another building 1

   Total built 10

2. Seaplanes and Stations: Development slow. Italy perhaps has 20 machines. Establishment of coast chain of 15 stations proposed.
3. Aeroplanes: Twenty-six squadrons of four monoplanes each. Four squadrons of seven biplanes each.
Italy has over 200 naval and military pilots.

BRITISH AIRCRAFT

The war test shows high efficiency in a new organization. The enterprise of British aviators is noteworthy—witness air raids against Düsseldorf and Friedrichshafen described elsewhere. Their seaplanes are " the best in the world "—not yet tried out in war. With dirigibles they are just beginning again, after a period of discouragement following the wreck of their first big rigid, the *Mayfly*, on her trial trip. (Contrast the dogged perseverance of the Germans after *their* disasters.)

1. Dirigibles:
(a) Rigids: None. A contract given the Vicker's Company for a large rigid of about 32 tons and speed of 50 m. p. h.
(b) Non-rigids: Seven in all—five very small, all turned over to the navy. Include a Parseval of 8.5 tons and an Astra of 7 tons with speed of 51.1 m. p. h. (" ace of clubs " section for strength).
Total built 7
Five modern ships ordered. Program calls for 15 by end of year. The newspapers report a company with capital of $1,000,000 formed to supply additional ships.
2. Sheds: No large sheds as yet; three small ones built for army; three large ones reported building.
3. Seaplanes and Stations: See " Aeroplanes." Stations at Calshot, Grain Island, Felixstowe, and Yarmouth. Others erecting and planned to complete a chain along the coast.
4. Aeroplanes: 109 aeroplanes and seaplanes on hand, 70 ordered. The Naval Flying School has 50 of these.

AUSTRO-HUNGARIAN AIRCRAFT

1. Dirigibles: Five (small, very slow, semi-rigid and non-rigid).
2. Sheds: Two (small).
3. Seaplanes and Stations: Number unknown; two good types of seaplane made in Austria.
4. Aeroplanes: Number uncertain, probably 130 to 150.

JAPANESE AIRCRAFT

Dirigibles: One (Parseval), another ordered.
Aeroplanes: About 20.

MINOR AIR POWERS

"Brassey" classifies as "minor air powers" (besides Japan), Turkey, Spain, and the *United States*. Various other states should be included in this category, some decidedly stronger than we are.

For a later estimate, necessarily doubtful at this time, the following is taken from the hearing of the Director of Aeronautics before the House Naval Committee, on or about December 1, 1914. The figures given include privately owned ships and machines, which would be commandeered in war.

	Dirigibles		Aeroplanes	
	Aug. 1914	Dec. 1914	Aug. 1914	Dec. 1914
Germany	40	60	1000	1400
France	22	30	1400	1400
Russia	18	20	800	1000
Italy	17 (March)	..	97 (March)	300
Great Britain	9	12	400	900
Austria-Hungary	8	8	400	400
Japan	2	2	....	20
(United States	..	..	23	....)

To realize, in another way, what foreign governments have been doing, we may glance at *their expenditures* for aeronautics. The data given was compiled in August, 1913, by the U. S. Army Signal Corps.

	Government Expenditures (5 years)	Popular Subscription (5 years)	Appropriations (for 1913)
Germany	$28,000,000	$3,500,000	$5,000,000
France	22,000,000	2,500,000	7,400,000
Russia	12,000,000	100,000	5,000,000
Italy	8,000,000	1,000,000	2,000,000
Great Britain	3,000,000	.....	3,000,000
Austria-Hungary	5,000,000	.....	.....
Japan	1,500,000	.....	1,000,000
(United States	435,000	.....	125,000)

Prior to the war, the German program for 1914-18 called for an expenditure of $12,100,000, of which $726,000 was to be immediately provided for by supplementary naval estimates. The

plans included groups of airships and of aeroplanes for active service, a material reserve, the construction of double revolving sheds, barracks, etc., and the establishment of a central aeroplane station with six outside stations. The actual increase has, of course, been on an emergency scale.

The organization of aeronautics in Great Britain has given fine results, and may be considered in connection with our own deferred but promising organization dealt with below.

The "Royal Flying Corps" has a naval and a military wing.

The former, in which we are chiefly interested, is administered (under the Fourth Sea Lord) by a "Director of the Air Department."

The Central Naval Office at Sheerness is under "The Inspecting Captain of Aircraft."

There is a Central Flying School (on Salisbury Plain), owned by the army and navy jointly, and a Naval Flying School at Eastchurch.

There is a Royal Aircraft Factory, and an Aeronautical Advisory Committee.

The Royal Flying Corps will be largely composed of officers and men who are not performing continuous service. Many of them will probably be naval and military officers performing duty with their ships or regiments, and many others will have joined on conditions of service resembling those of the special reserve of the army.[15]

The Central Flying School is for both branches of the service. The training and study includes:

(a) Progressive flying.
(b) General principles of mechanics.
(c) Construction of aeroplanes and engines.
(d) Meteorology.
(e) Military aerial observation.
(f) Navigation.
(g) Cross-country flights.
(h) Photography.
(i) Signaling.
(j) Types of warships (all nations).

The Royal Aircraft Factory is a *laboratory* as well as a *workshop*. Its duties include: Higher training of mechanics; the reconstruction of aeroplanes; repair work; tests and experiments with British and foreign engines, and other experimental work.

[15] Report of U. S. Military Attaché, London, July 31, 1912.

Experimental and research work pertain also to the Aeronautical Advisory Committee. This committee, the factory, and the two wings are interlocking: an ideal interweaving of theory and practice.

A noteworthy feature of the British system is the provision to encourage private manufacture and private aviation,[16] and also to make England mechanically independent of other air powers in times of stress.

A certificate from the Royal Aero Club is a required qualification of navy and army fliers.

Noteworthy features of this organization are:

(1) The whole aerial establishment is placed under one corps, which may at any time become separate from, and coordinate with, the navy and the army.

(2) Meanwhile, the branches are administered by the navy and the army *separately, but in close cooperation.*

(3) In both navy and army, aeronautics are administered separately, not under any existing arm or corps. In the army these constitute the fourth arm.

(4) Theoretical and practical development are both looked out for and are closely interworked.

(5) Military and private (industrial) activities are coordinated, and the latter are encouraged in every way.

The French and German organizations are of course admirable; but, since England had the benefit of all their ideas (as we may, with hers and our own stirred in), it seems unnecessary to summarize them here.

To show what a good system can accomplish in two years (1911-13): Great Britain's air strength in 1911 was almost *nil.* Though preparing for war across seas, she was completely outclassed on high by both Germany and France. Men like Grahame-White and Bannerman-Phillips were shouting from the housetops. Since then she has taken the following steps:[17]

[16] The objects of this are not only to provide a reserve of flying men, to stimulate invention, and to keep alive public interest, but also to provide aerodromes, landing places, and sheds at convenient intervals throughout the country.—Report of U. S. Military Attaché, London, July 31, 1912.

[17] See *London Times,* January 8, 1914: "Some Controverted Questions."

(1) Bought and tried every prominent domestic and foreign aeroplane.

(2) Organized the Advisory Committee referred to above.

(3) Organized the Royal Aircraft Factory.

(4) Invited the mechanics of the world to a military competition, and bought the best machines thus indicated.[18]

(5) Ordered sufficient machines from home makers to put British works on an industrial basis.

(6) Established the Central Flying School and encouraged private schools.

See what a "death-bed" repentance has accomplished! and, as it happens, just on the eve of war. Britain's only bitter regret is that she threw up her hands and quit when the *Mayfly* fouled the wires, and was forced to make war without dirigibles.

Can any good American read these records of foreign achievement without asking uneasily:

"And what have We been doing?"

VII. THE PROGRESS OF AERONAUTICS IN THE UNITED STATES

In a long chapter on "British and Foreign Aircraft: Progress in 1913," "Brassey" devotes just *ten words* to the United States of America—the last-named of the "minor air powers."

So it is. The country of Langley, who lived too soon and was jeered to his grave;[19] of the Wrights, who developed the aeroplane; and of Curtiss, who made it web-footed—is now among the last in the race. Having invented the biplane, we forced the Wrights to France for encouragement; having developed the seaplane, we yielded our birthright to England. Until the present year, the military dirigible was, to the American on the street, the fantastic product of a dreamer's brain. Rumor has it that we once owned a small non-rigid—but where is this destroyer of cities? Now we talk of building a dirigible—a ship of 75,000 cubic feet. Germany has Zeppelins of 950,000 cubic feet and over.

We cannot question the wisdom of small beginnings. But what a pity we are just beginning now!

[18] The U. S. Army recently attempted a similar meet for domestic aviators; but, owing to lack of funds, the prizes offered—the purchase of the three best machines at prices little above cost—were inadequate; and the meet was abandoned for want of entries.

[19] With a few minor changes, Professor Langley's own machine has recently been made to fly.

Our present strength is represented thus:

Dirigibles	None
Aeroplanes (including seaplanes)	23

Nelson called bitterly for more frigates (eyes); our next war chief may wail in vain, needing aircraft.

To be without this adjunct is worse, analogously, than being without a telescope and the height from which to use it. The comparison between the fleet so provided and that without this essential aid is equivalent to the comparison between vision from near the water's edge and the wider visions obtained from the mast of a ship.

The relative blindness of our fleet to-day is due:

(a) To a lack of public interest in aviation, especially of the military kind.

Imagine, in America, popular subscriptions aggregating several millions!

(b) To a tardy *service* appreciation of its nature and importance.

How much time has our most progressive institution, the Navy War College, given to naval aeronautics?

(c) To a marked need of governmental support.

(d) To the backwardness of our aerial industries for want of fostering.

Aviation is waning as a circus attraction, and public interest in its military features has not yet awakened.

So far, in dealing with the past and the present, the writer may have seemed pessimistic. But for the *future* of American aviation there is a rainbow of promise. Both in the army and in the navy there are signs of quickening: already steps have been taken that may give us an efficient, if small, air fleet within a few years—but let us pray for the blessings of peace during the long remaining months of unreadiness! As others have said, our development must be healthy and not too hasty

> "The heights of great men reached and kept,
> Were not attained by sudden flight,"

but it behooves us to lay on "all the traffic will bear" and not to lose a minute for want of fuel: in other words, to make liberal allotments; to detail officers as fast as machines can be got ready for them; to inspire in our manufacturers the confident feeling that they can sell as fast as they choose to make.

All of which depends on our national policy. But this much is certain: it is inconsistent to maintain "an adequate navy" without building up an airfleet. The question of "aerial policy" is discussed below.

Coming now to what has been done in the recent past:

(1) Army aviation has been organized and put on a firm basis. The section of aeronautics has been created under the signal corps, and plans formulated for steady growth (so far as concerns the use of aeroplanes) within that corps.

(2) As to naval aviation, with which we are particularly concerned, steps are taking towards carrying out the admirable plan of organization outlined by the Board of Aeronautics which reported to the Secretary about a year ago (see below).

As the efforts of the two branches have much in common, both will be touched on here.

ARMY AVIATION

Although our army and navy aviation have been contemporaneous, the army has taken the lead in a legalized organization. The act approved July 18, 1914, increased the signal corps by the addition of an aviation section, not to exceed 60 officers and 260 enlisted men. This addition was to be made by details (creating vacancies) from the line of the army. Provision was also made for increased pay, at rates varying from 25 per cent to 75 per cent, for officers under three classifications—aviation students, junior military aviators, and military aviators—and 50 per cent for enlisted men. The "death benefit" for officers and men killed in aviation was increased to one year's pay. Officers ranking below captain were made eligible for details of four years to the aviation section.[20]

So far,[21] 24 officers and 115 men have been detailed. A Signal Corps Aviation School has been established on North Island, San Diego, California; and, under the new act, has been enlarged and reorganized. There is a smaller school in the Philippines; and a station was established at Fort Kamehameha, in Hawaii, but no longer exists separately.

[20] The War Department has invited unmarried officers below 30 to apply for this detail.

[21] Referring to date of October 3, 1914.

From June, 1913, to February, 1914, an amount of flying quite unprecedented in the history of aviation in the United States was carried on at the Signal Corps Aviation School.[22]

The general policy is to have officers receive a preliminary training at civilian schools, before going to San Diego.

It is also planned to have at Fort Sam Houston, San Antonio, Texas, where there is a large army post, an aeronautical center, for the collection of material, the study of aeronautics, experimental work, and flying with troops under service conditions. Other (divisional) centers are to be established when practicable.

The first aero squadron, consisting of 16 officers and 77 men, with eight aeroplanes, was organized at San Diego during September, 1914. The standard machine adopted is the tractor biplane.

Experiments have been performed in bomb-dropping with "satisfactory results," and in observing submarine mines from a height; a demonstration was given of a parachute for aviators, which promises to be useful. The Philippine detachment has had practice with seaplanes.

As yet, both branches of the service are handicapped by the slow development of aeroplane manufacturing at home. Steps are taking towards improvement in this, and at least one first-rate *engine* has been produced. Doubtless another effort will soon be made to arrange a competition that will drag American talent into the open. As late as February, 1914, the army had at San Diego, only five machines considered suitable for service. Though several have since been added, we are still in no condition to alarm France or Germany with their thousand machines each.

Plans have been formed to encourage aviation in the National Guard and to establish an aeronautical reserve—but these are mostly tentative.

Reference was made elsewhere to the fact that the army is waiting for other powers to develop the *dirigible*—a policy that is economical, but open to the objection that if, at any given time, war breaks out, we are lacking in material, men, and knowledge, for what may prove to be a valuable instrument of warfare.

[22] Annual Report of Chief Signal Officer, U. S. Army.

NAVAL AVIATION

So far, in the navy, no "aviation corps" has been legalized;[23] no increase of personnel has been allowed; no organization has been sanctioned by Congress; no large specific appropriation has been voted. Allotments have usually been made from the different bureaus by authority of the department. For the current year an allowance of $350,000 (from the bureaus) is available.

Thus far, in other words, the navy has been left "to work out its own salvation" in the air.

But there is another side to the picture. About a year ago, an Aeronautical Board (composed mostly of non-fliers) made the report outlined below, which deserves not "criticism," but appreciation. This board was headed by Captain Chambers, who for years has been the "torch-bearer" for aviation in the United States. The second in rank was Captain Bristol, the present Director of Aeronautics. The object of the report is to establish guiding principles, a line of effort, and an organization for naval aviation. It has resulted so far in the assignment of an aeronautical station ship, the establishment of an Aeronautical Office at the Navy Department under a Director of Aeronautics, steps towards the encouragement of manufacturing aircraft and towards the purchase of dirigibles; increase of equipment and plans for the addition of 32 to 48 aeroplanes to those on hand.

With a plan of operations and a director of rank responsible to the Secretary direct, the future of naval aviation is hopeful. But we must not discount the future too heavily, forgetting our present weakness. We now have 12 machines and 16 qualified officer fliers (no enlisted man has yet qualified), and 50 men being trained as mechanicians, with an aeronautical station at Pensacola, Florida, and *tent hangars* for the machines. Rapid expansion will be impossible so long as: The number of obtainable machines is severely limited; aviators are obtainable for training only at the expense of the fleet; and appropriations are too small to tempt manufacturers. An appropriation of $1,187,600 has been asked for by the Director of Aeronautics,[24] but the department has not approved requests exceeding $350,000.

[23] The detail of officers to aviation duty has been authorized by law and provision made for extra pay.

[24] See published Hearing before the House Naval Committee.

It has been pointed out, that since manufacturers are even less interested in seaplanes than in aeroplanes, and civilian seaplanes fly on the smooth waters of the Lakes, the navy still has to solve the problem of building its own seaplanes for rough weather. These will be needed for the fleet.

The following are the essential features of the plan proposed by the Board of Aeronautics:

PROPOSED PLAN FOR NAVAL AERONAUTICS[25]

The report of the Aeronautical Board (approved by the department) is well worth reading in full; it inspires confidence in the outlook for our naval aeronautics. Of necessity, it must be only summarized here.

I. THE GUIDING POLICY

We must be superior in all articles of aerial equipment—in dirigibles as well as in aeroplanes.

Aerial service will be adequate if based upon efficient work for and with the fleet.

We must not waste effort by attempts at aerial coast defence, and must concentrate our efforts in one aeronautic station or center, which will be useful mainly for instruction and experimentation.

II. THE MAIN ELEMENTS

These are: (1) Aeroplanes, (2) dirigibles, (3) kites, (4) captive balloons.

(1) *Aeroplanes* should be used from both fighting ships and auxiliaries. *Every battleship should carry them.* Equipment, spares, etc., should be stowed on auxiliaries, some of which should be fitted to fly machines.

The *development* and *use* of aeroplanes should be guided by the following principles: the instruction of naval and of marine corps officers should proceed with machines of the same types, with a standard type of control. Pilots of either corps should be available for any service over land or water. In short, the principle of amalgamation should obtain.

Equipment for the fleet should include 50 aeroplanes, and for *advanced base outfit,* six aeroplanes, with accessories.

It is apparent that "aeroplane" as used in this report, includes "seaplane."

(2) *Dirigibles* must be developed gradually. We cannot immediately construct the largest, but must first train a personnel. But we should at once provide small and medium-sized ships for use with expeditionary forces (and for training).

Shelters are important, but we might at first content ourselves with a mooring mast. In bad weather deflation would be necessary.

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[25] Published in full in February number of *Flying.*

An auxiliary for dirigibles will be needed. At first, one on hand can be modified for this use.

(3) *Balloons* will certainly be useful for instruction, perhaps also with the fleet. At present we should experiment with one balloon for training, and get three small captive balloons for weather observations.

(4) Plans for *kites* should be furnished all flagships.

III. AERONAUTIC AND AVIATION CENTERS

The Pensacola Navy Yard is recommended for an aeronautic center owing to climatic and hydrographic conditions, situation, and the convenient facilities of the navy yard.

Additions to the plant should include two dirigibles for training, a floating shed, a hydrogen plant, a mooring mast, two small balloons, an observatory, facilities for storage of gasoline, a combination captive and free balloon for experimental purposes—and facilities for work, reading, and recreation.

The *personnel* of the center should include a commandant with two divisions under him: an aeronautic division for the work of instruction, an operative division for the plant. There should be various aides, warrant assistants, and a marine corps detachment distinct from the aviation personnel of that corps. Officers and men from the two corps (line and marine corps) should be in proportion to the relative numbers in the corps.

The aviation center should also be at Pensacola, on account of favoring climate, facility for cooperation between aeroplanes and dirigibles, economy with efficiency, and facility for cooperation with the fleet.

The center should have a sea section and a land section.

The sea section should have a *ship*, preferably of the *Charleston* class. She should experiment with methods of hoisting and of stowing aeroplanes, and should do experimental work in connection with dirigibles. This ship should be available, with its air personnel and fixtures, for use with the fleet on short notice. Besides the ordinary complement (for ships in reserve) it should have three experienced air pilots available also for ship duty.

The land section should have six hangars, facilities for aviation practice, motor tractors, boats, a tug lighter, and other necessary equipment.

IV. LABORATORY WORK

The board recommends that the Aeronautic Laboratory be located at the Washington Navy Yard, in connection with the Model Basin and in cooperation with the National Aeronautic Laboratory.

V. COURSE OF INSTRUCTION AND DUTY FOR STUDENTS AND AIR PILOTS

Instruction should include: practical work with machines; instruction and practice in flying.

Air pilots should be detailed for experimental work at the laboratory, and for advanced instruction in aeronautical engineering at colleges.

Graduate air pilots will constitute a *reserve*.

Aviation service should count as sea duty.

VI. SERVICE WITH THE FLEET

Air pilots should gradually be assigned to ships of the fleet.

VII. THE DEPARTMENT ORGANIZATION

In brief, the air department should not be established as a separate bureau, but should avail itself of the effective working powers of the present bureaus.

Under the office of the secretary (division of personnel) should be an office of naval aeronautics, at the head of which should be a director of naval aeronautics.

The relations of the director to the secretary and to the bureaus will be *advisory* and *coordinating*.

The *personnel* of his office will include an assistant director (preferably a flier), and other assistants, *each representing a bureau*. One of these shall be a flier.

All the above personnel of the office will constitute a standing Aeronautic Board.

VIII. ESTIMATE OF EXPENDITURES

To establish an adequate aeronautic service the board recommends an appropriation, as early as possible, of $1,297,700.

Such a simple, clear and logical plan of development requires little discussion. The only doubt is, "Will it be carried out promptly?" Let us remember that other nations will not be standing still while we are learning to walk.

Two doubts present themselves:

(1) Should not steps be taken towards cooperation between navy and army, as in Great Britain? These cannot be taken by either body acting alone; but it will clearly be a defect if, in a naval war, the army aviators are not available as a naval reserve, and *vice versa*. The lack of a "joint flying school," or its equivalent, seems to be the weakness of our dual organization.

(2) Should aeronautics be under a separate bureau in the Navy Department?

In the present writer's opinion the board has given the right answer, at least for the present. Their action is in line with that of the army, which has put the infant under the fostering care of the previously organized and technical signal corps.

But there are, distinctly, two sides to the question. Though at present a struggling corps can well avail itself of machinery already in operation, the "Child may be bigger than the Fi-er-man" before many years—and it may then be difficult to pull away from the foster parent. It might well be decided (some day)

that the technical handling of all air machinery (balloons, fuselage, cars, equipment, and motors) calls for specialized treatment just like that of steam machinery. It is realized, in the aviation section of the signal corps, that the tail may soon wag the dog, and that separation may eventually result.

We must also look forward to the time when the air fleet may leave the army or the navy for a sphere of its own.

(3) No provision is made for an aircraft factory. As to seaplanes in particular, the Director of Aeronautics says "we must work out our own salvation." This being true, why in these days of navy yard shipbuilding and government armor plants, should the inevitable aircraft factory be delayed?

As to *detailed comment:* the naval plan resembles the army's in calling for an aeronautical center. Would it not be wise, however, to have branch establishments on the West Coast, and in each of the Island possessions? The lack of a "sub-center" at Mare Island is felt in more ways than one.

The great advantage of Pensacola for an aeronautical center is that the *plant* is already there—shops, buildings, and slips, that it would take precious years to get elsewhere. As at San Antonio, aviators at this center can be in touch with the force they serve—in our case, the fleet. For *instruction* in flying, Pensacola is not so good as San Diego; air currents are more uncertain, thunderstorms and rainy days are more frequent. But the beach at Pensacola is convenient for seaplanes, and the opportunities for cooperation at the center outweigh all objections. *Preliminary* training elsewhere under ideal conditions may prove advantageous. Army aviators get this at civilian schools.

Laboratory work, as so far organized, does not seem to be adequate, compared with the plants abroad. It is indeed regrettable that the legalizing of an aerodynamical laboratory (in which eminent scientists gave their services gratis) went out on a point of order in the House of Representatives. Doubtless the cooperation of the British Advisory Board with their Royal Aircraft Factory does much for the science of flying.

PLANS FOR THE IMMEDIATE FUTURE

The present plans of the aeronautical office, as outlined in the Hearing referred to above, include the following items:

(1) Provision for:

(a) 48 Aeroplanes.
(b) 1 Dirigible for use.
(c) 2 small dirigibles for training.
(d) 1 hydrogen set.
(e) 1 mooring mast.
(f) 1 kite balloon.
(g) Hangars at Pensacola.
(h) 3 picket boats.
(i) Gasoline storage, Pensacola.
(j) Maintenance.
(k) Aeroplane hangars, Pensacola.

(2) Negotiations with possible manufacturers of dirigibles.

(3) Inducements to manufacturers of aeroplanes and of dirigibles.

(4) Extra pay for enlisted men—35 per cent additional while on duty involving flying (50 per cent in the army).

(5) Increase of extra pay for qualified officers to 35 to 50 per cent (50 to 75 per cent in the army).

(6) Increase of "death benefit" to one year's pay (already allowed in the army).

(7) Authority for detail of an increased number of officers and men to aviation duty—not exceeding 48 officers of the navy, 12 of the marine corps; 96 men, navy; 24, marine corps.

Although the army list was increased by the number of officers assigned to aviation duty, it is expressly provided in the proposed bill that there shall be *no increase* in the total number of officers in the navy.

The ultimate needs of the navy, as outlined, will include at least 400 pilots with 200 aeroplanes, at an estimated cost of $2,200,000. But:

The expenditures entailed would be very slight in comparison to the sums spent on those other types of national insurance, the army and navy.[38]

VIII. WHAT OUR POLICY SHOULD BE

We have seen what our position in war would be without an airfleet. As well fight without the radio. Only in the last month Germany, with her few available ships, won a victory in the South Pacific through better sources of information and quicker concentration.

[38] "Aircraft in War."

Before going further, let us recall some conclusions reached in the preceding pages:

(1) It has been clearly shown in war that aircraft are invaluable for reconnaissance and for the preliminary control of gun-fire.

(2) The offensive use of aircraft, especially in numbers, must be considered a grave menace in war.

(3) Dirigibles are valuable for long-distance reconnaissance, and more effective than aeroplanes in offensive work. They are too vulnerable for "spotting."

(4) Offensively, aircraft will be used for *raids* with material and moral effect.

(5) Aeroplanes are invaluable for "spotting" and short-distance scouting.

(6) The size, range, and numbers of aircraft are constantly increasing.

(7) With increase of numbers aircraft will be diverted more and more to offensive and other uses.

(8) They are very important in connection with those latter-day instruments—submarines and mines.

(9) The leading foreign powers now have great airfleets.

(10) The United States is practically without an airfleet.

(11) Steps are taking towards the gradual building up of our air power.

Keeping the above facts in mind, what should our aerial policy be? Should we specialize in one of the principal types? Should we develop all? If we build dirigibles, shall we build rigids (like Germany) or non-rigids (like France and England)? What constitutes an adequate air fleet? And what should be our building program?

France began building aeroplanes only, and soon found that she must have dirigibles too. Germany began with dirigibles, and now has as many aeroplanes as France. England built aeroplanes and is now rushing dirigibles into air.

If we are to learn from the experience of those who *know*, there can be but one answer—*both types are needed, and the dirigible without delay*. Far better to be mistaken, in good company, than mistaken and helpless alone. If we had waited for an actual demonstration before building submarines, we should have commenced our building, or our plans for building, in 1914!

Germany has "pulled the chestnuts out of the fire"—her aviators have passed through fire and storm; the Zeppelin and the Parseval are ready for us. Perhaps we have, by good luck, lost nothing so far: but every minute now wasted is a minute of danger. Our scouting in both oceans must cover long distances and demands the airship.

An adequate air fleet must be relative to the fleets of those who may fight us. Its size must be governed by the same policy that governs the navy's. In both cases we must be able to meet any attack that can be delivered against us, since ultimately the two aerial fleets will clash. An invader's strength will, of course, depend on increase of range and the development of transportation facilities for aircraft. There will be some drop in potential in crossing the ocean, but in the Pacific, where we have islands to protect, we may have to suffer that drop ourselves. The policy clearly indicated is, thus:

Air strength superior, at the point of application, to that of the strongest opponent considered.

AN ADEQUATE AIR FLEET AND A BUILDING PROGRAM

When we come to expressing this policy in figures, and formulating a program, we are brought up short against two facts:

(1) While we Americans jealously compare our navy, ship by ship, with the navies of other first-class powers, we have been indifferent to the fact that the air navies of France and Germany outnumber ours in the proportion of about 60 to 1. Hence a really adequate building program, though moderate in expense compared with that of naval increase, would excite amazement and ridicule.

(2) If public sentiment were fully aroused, and Congress were ready to vote immense sums, adequate increase would still be impossible because we have not the plants to build aircraft rapidly or the personnel trained to man them.

As to *naval* aeronautic expansion, we are further limited because the army must expand at the same time.

Hence the problem is not strategic or tactical, but economic and industrial. It is not difficult to show, by diagrams, what force of aeroplanes would be necessary for service with the fleet—our first and foremost problem. It has been shown that:

"A fleet of battleships represents about three miles in length. With a radius of 300 miles around that battleship fleet, you have a circle of 1900 miles; and there should be one aeroplane to every 40 miles of the circumference of that circle for scouting work. That would require 50 aeroplanes for one fleet, with 50 in reserve, which is the least allowance that could be considered. That makes 100 in the fleet actually, and then another . . . . " (hundred in reserve would be needed).[37]

[37] Hearing of the Director of Aeronautics before House Naval Committee.

This, of course, makes no allowance for casualties in war; for wear and tear of machines; *for the force necessary to combat hundreds of aeroplanes accompanying an enemy fleet;* for forces needed to escort our dirigibles or to attack the enemy's; for forces permanently stationed at bases and island possessions. The sum of all this carries us into the hundreds, or thousands; for we know it would take years to acquire such a force, and that our possible enemies, already averaging nearly a thousand machines each, will not stand still while we are catching up.

We must fix in our minds the idea that an aeroplane, in point of size and cost, is comparable rather to a steam launch than to a *ship*. The thought of 1000 launches would not stagger us; but we talk in whispers of 40 aeroplanes!

We may, then, with Captain Bristol, take 200 aeroplanes *as an absolute minimum*. With less than this we remain a "minor air power," or no air power at all. Further than this, we must form some estimate of the number that France or Germany, say, could bring to this side of the Atlantic in about five years from now, and make that number a *desideratum* for building—"build that number," we might like to say, but for reasons given above that seems impossible.

At present there is only one thing to do: build just as many aeroplanes and dirigibles as our resources will permit. Appropriations must be liberal enough to make manufacturers certain that it will pay them to install the necessary machinery and to begin making aircraft.

For the present, the suggested program, 48 aeroplanes and one dirigible (exclusive of two "baby dirigibles" for training), doubtless represents all that can be attempted: but at this rate, *if maintained*, we should catch up with France and Germany in some 28 years!

Since existing foreign dirigibles are not (at present) trans-Atlantic voyagers, our start with airships is more nearly even. We must at least be able to meet an enemy's transportable non-rigids, easily supplied with gas by the plants of auxiliaries or by cylinders of compressed hydrogen.

As soon as practicable we should formulate a program covering, like Germany's before the war, a period of four or five years. After getting under way, we could hardly build less (for naval use) than 100 aeroplanes and four dirigibles each year.

We now reach the question: should we build Zeppelins, Parsevals, or Forlaninis?—rigids, non-rigids, or semi-rigids?

It would be useless, at this time, to go fully into the relative merits of these types. Among the characteristics of the Zeppelin may be mentioned:

(a) Greater size, speed, radius, carrying power.
(b) Correspondingly greater offensive power.
(c) Less (though great) vulnerability.
(d) Ability to travel far without loss of gas.
(e) Durability, owing to material of envelope.
(f) Low gas pressure, involving diminished loss from holes.
(g) High cost.
(h) Dependence upon expensive *sheds*.

and among those of the Parseval:

(a) Convenient size—can be more easily handled by an inexperienced personnel.
(b) Can be moored to a mast in ordinary weather.
(c) Can be instantly deflated by means of a ripping seam.
(d) Late models can be subdivided, diminishing vulnerability.
(e) *Can be easily taken apart and shipped.*
(f) Envelope easily repaired or replaced.
(g) Is suitable for scouting and for *mine-laying*, etc., rather than for offensive work.
(h) Loses gas rapidly, owing to nature of envelope and high pressure, hence cannot make the longest flights.
(i) Is extremely vulnerable, and is not so well protected against attack.

The Forlanini has some of the advantages of the Zeppelin; but is vulnerable (non-cellular); particularly liable to catch fire; and, owing to its unwieldy keel, is non-portable.

Since we must flutter before we can fly, we cannot build Zeppelins before learning to make and handle non-rigids. By that time the relative usefulness of the Zeppelin will be known. In the Atlantic, until its range is increased, we can rest easy if prepared to counter the hostile non-rigids that can come across "knocked down." But it is a safe guess that in five years we shall be calling loudly for "dreadnoughts of the air."

Supposing we adopted, for four years, the modest program referred to above, our yearly naval increase budget (omitting

the cost of hangars, sheds, masts, gas-plants, motor tractors, etc.) would be:

100 aeroplanes (with spares, etc.) at $11,000	$1,100,000
4 dirigibles at, say, $250,000	1,000,000
Total	$2,100,000

or about one-fourth the cost of a battleship. Surely there is nothing revolutionary about this, even if we classify aircraft as "auxiliaries."

The problem of personnel is less difficult in view of the fact that a flier can be quickly trained and that our navy list is strong in the lower grades, where men of flying age abound. Judging from the mechanical ability and intelligence of our enlisted force, we shall soon have qualified fliers from forward. But to utilize these officers or men, immediate changes in existing law are necessary. At present, even the number eligible for detail is limited. It is hard to see how provision can be made for hundreds of officer-aviators without a corresponding increase in the navy list, which is already too small for marine purposes. The natural desire to avoid crippling the sea-going fleet *will inevitably retard development in matériel.*

It is not apparent that any economy will be effected by an attempt to substitute civilian fliers. They "come high," and necessarily lack some qualifications for military service. Undoubtedly they should form a reserve, and an effort is making to enroll them for this purpose; but even so, their name is not legion. Steps have also been taken to organize an air service in the naval militia.

It will, it is hoped, be a function of the Naval War College to impress upon the service the strategical and tactical aspect of aeronautics. When these are more fully realized and studied in the *navy,* public sentiment will follow expert lead, and the air fleet will come into its own. Should not aircraft be injected into strategical and game-board problems?

IX. OUR OPPORTUNITY

We now have a glorious chance to utilize the teachings of the European war: while the nations at war are cutting each other's throats, to observe, prepare, and secure command of the air in the Western Atlantic. We can luckily avail ourselves of all their peace-time mistakes and war-time experiences, and, with a mini-

mum of effort, get an air fleet of the latest kind—always supposing we are not interrupted. The present contest may finally result in a loss of belligerent personnel and matériel that will make the task of catching up correspondingly easy.

As to dirigibles, we are fortunate in another way: a first-class dirigible without its shed is helpless: and the sheds of Europe have become too small.

If, after training with a few non-rigids, we build only the largest air dreadnoughts, with revolving sheds to match, we can quickly rival those who have "borne the burden and heat of the day." Like Germany, we can standardize our aeroplanes; and, building only the best, may find ourselves, when Europe takes breath, among the Great Air Powers.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ESTIMATE OF THE SITUATION

By REAR ADMIRAL AUSTIN M. KNIGHT, U. S. Navy
President U. S. Naval War College

If we recognize that the real work of a war college is training for war command, we shall be led to inquire at what ends this training should aim, and by what methods it should proceed. Evidently it must aim first of all at the development of logical and concentrated processes of thought, which, beginning with a clear recognition of the end to be attained and the facilities and difficulties involved in the situation, proceeds by logical steps to a decision upon the course best fitted to attain the end.

There is nothing here that is peculiar to training for war command as distinguished from other training which looks to the development of intellectual processes leading to definite action.

Whenever we find ourselves confronted by a situation which calls for something to be done, we pass from recognition of the necessity for action to the action itself by mental processes which, often without deliberate consciousness on our part, follow a certain clearly defined course. We see the something to be accomplished, evaluate and balance the factors entering into its accomplishment, and decide upon the way of going about it. In many, perhaps in most, cases, the something to be done is rather vaguely seen, the evaluation of factors involved is incomplete, and the decision is hasty; but the process, however superficial, is inevitably logical to the extent that some sort of a decision precedes the action, some sort of an estimate precedes the decision, and some recognition of the end to be attained precedes the estimate.

Where great issues depend upon the action taken, as is the case in war and the preparation for war, it is of vital importance that the estimate should be carefully made, covering all phases of the situation, giving adequate recognition to facilities and to obstacles, adjusting means to ends, and binding the something to

be done with the decision how to do it, by a thorough and logical process of reasoning. This we call "Estimating the Situation."

The "estimate of the situation," then, in its military application, differs from the ordinary mental processes which govern the acts of our everyday life only in this—that it is a very thorough and a very methodical course of reasoning, directed along lines carefully systematized with a view to giving the fullest attainable assurance that no important factor shall be overlooked, and guarded from hasty and superficial treatment by the formality which is deliberately imparted to it in the teachings of the War College. It is a logical process which, starting with a mission to be accomplished and taking account of all existing conditions, leads up to a decision which, when reached, is seen to have resulted more or less inevitably from the mission and the conditions considered together.

The form which has been adopted at the War College for estimating the situation follows in its general features the forms which have been developed and employed by such authorities as Buddecke, Grippenkerl, and Audibert. There are differences in detail between these authorities, but all are agreed as to the necessity of providing a form which shall serve as a guide; and the differences in the forms which they suggest are such as to accentuate the importance of the general principles which lie at the foundation of them all. It is recognized, of course, that a form is an empty thing in itself, and that too much stress might easily be placed upon it. But experience has shown that it is always helpful as a guide to logical processes of reasoning, and that to a beginner, at least in the field which we are now considering, it is altogether indispensable. It is not to be supposed that in actual warfare every situation which arises can be dealt with in detail and in writing, but the habits of thought which are developed by the practice of this system in cases to which it is applicable—as in the problems of the War College and in most of the strategical situations of actual war—should result in an instinctive application of the same principles when a sudden emergency calls for an instantaneous decision. Our insistence, then, upon adherence to a prescribed form is a means to the end which has been laid down as that toward which the training for war command should first of all be directed—the development of logical and concentrated *habits* of thought.

In the problems which are drawn up at this and other war colleges, an effort is made to simulate conditions as they would confront a commander operating in the field. At many points it is easy to do this; at others it is so difficult that only partial success can be hoped for; at still others it is altogether out of the question. One of the most important points at which this effort fails is in the initial survey of the conditions upon which our estimate of the situation must be based. In practice, a commander must make this survey for himself, outlining the field of operations in such a way as to secure a broad outlook over the field with all factors in their proper relation to each other. In war college problems the initial conditions are necessarily stated by the framer of the problem. This difference between theory and practice should be kept in mind by the student who must remember that, in actual warfare, his estimate of the situation should be preceded by an outline sketch of the situation as a point of departure for the estimate. This preliminary sketch will closely resemble the *statement* of a problem issued for study at the War College.

In the form used at the War College the estimate of the situation is treated under four heads, as follows:

1. The Mission.
2. The Enemy Forces: Their Strength, Disposition and Probable Intentions.
3. Our Own Forces: Their Strength, Disposition, and the Courses Open to Us.
4. The Decision.

The mission is the task which lies before us for accomplishment, and a clear understanding of this task is the first step toward its accomplishment. How shall we arrive at such an understanding? That depends upon conditions. If we are acting under orders received from higher authority we must begin by studying these. If they have been properly framed they will themselves define the mission, and may, if clearly and concisely expressed, be accepted at once as a statement of the mission, subject, however, to modification in the light of *new* information which may have come to the knowledge of the officer receiving the orders and which was not in the possession of the higher authority when the orders were issued. The principles governing in this case will be explained hereafter. If the form of the orders

does not lend itself directly to this application, we must search out the essentials and throw these into a shape as concise and clear as is practicable. If the instructions are too general to be regarded as defining a mission, we must apply their spirit to the conditions which we find existing and deduce a mission for ourselves in harmony with this spirit.

In the extreme case, we may have no instructions and no source to which we can look for them. Here we must be guided by a broad conception of the duty which our position carries with it, and the responsibilities of loyalty and initiative which result from it.

We may say, then, that in general, to determine a mission based upon orders, we study the orders; while to determine one based upon a situation, we study the situation.

A variation sometimes introduced in the form is to consider "Our Own Forces" before "The Enemy Forces." This has some advantage in cases where the mission is primarily offensive. It is a matter of detail, chiefly important because of a tendency which we may assume as inherent in it, to fix the attention upon offensive rather than defensive action, and to encourage *initiative* in the *mission* and the decision.

The mission is always the ultimate task which *at present is assigned to us* for accomplishment—the end at which we are told to aim and toward which everything included *in our present estimate* must be directed. There may be, and often will be, many steps by which we advance toward this end; and it may be that only one such step demands immediate action and immedaite instructions to our subordinates. Each such step, directed along a line which leads toward the end at which we are aiming, constitutes in itself a secondary or temporary mission, which may become, and usually does become, *the* mission of a subordinate commander. These secondary missions must not be confused by the commander-in-chief with the mission upon which his attention is to be fixed, and upon which all of his efforts must converge. This may be "To Destroy the Enemy's Army," "To Capture the Enemy's Capital," "To Destroy the Enemy's Fleet."

It may be that the first step toward the capture of the enemy's capital is to gain possession of a certain mountain pass, and this may be a task assigned to a subordinate commander, for whom it becomes *the* mission. It may happen that this preliminary

operation calls for all of the forces available, and that it must be directed by the commander-in-chief himself. This does not make the capture of the pass "the mission" for him, if, as in the case assumed, his instructions reach beyond this to the capture of the capital. Nor is the situation changed even if he cannot at once decide what steps must follow the capture of the pass. So long as there remains before him under his instructions a larger task to which the task immediately at hand is only one step, he must take as his mission the larger task which lies at the end of his road.

This brings us to a point which has been much debated, and about which there has long existed a difference of opinion at the War College and elsewhere. This difference, as it happens, is a matter of form rather than of principle. It is well illustrated in the situation which has just been outlined. A commander, acting under instructions to capture the enemy's capital, finds that the first step before him is the capture of a certain mountain pass, and that this operation calls for the employment of all his forces and must be directed by himself.

If the task were assigned to a subordinate commander, it would manifestly be the mission for that commander. Is it, then, the mission of the commander-in-chief, since he is personally to direct it?

The answer is that it is not for him *the mission*, but assuredly it is *a* mission, and one for which he must prepare by an estimate which stops with the capture of the pass. It in no sense replaces or obscures *the* mission toward which it is only the first step, but for the moment it demands an estimate and a decision of its own.

We decide, then, to recognize in certain problems, an *immediate mission* leading up to the accomplishment of the general mission. This immediate mission may become apparent in our study of the general situation, in which case it will appear as a part of our general decision. In the case which has just been considered, the commander-in-chief, in estimating the general situation, finds that a necessary step toward the accomplishment of his general mission—the capture of the enemy's capital—is the capture of the mountain pass, and the general decision includes, we may imagine, some such phrase as this: "Proceed to capture the ——— Pass, and then deploy beyond the mountains, advancing in three parallel columns by the three main roads leading across the valley, investigating the city on the east, west and south, and

sending the cavalry to cut the communications from the north." Here is the general decision, and as a part of this we find an immediate mission—to capture the pass—as a step toward the accomplishment of the general mission.

The commander-in-chief has, in effect, assigned himself a new mission, included in the larger one, exactly as, under other conditions, he might have assigned the smaller mission to a subordinate commander. The new mission *calls for a new estimate and a new decision,* all keeping in view the larger mission and looking toward its accomplishment. This means that each individual step must be so planned that it shall lead up to, and prepare the ground for, the step which is to follow. If, for example, the first step is to locate the enemy's raiding force and the second to destroy it, it will be futile to locate the force without making provision for the step which is to follow.

In what precedes we have seen an immediate mission developing in our estimate from conditions known or assumed to exist; but there are other cases in which such a mission develops unexpectedly from the progress of events. In working toward the general mission along the lines of the general decision, a situation arises which was not foreseen when the decision was framed. Here, again, the new situation must be estimated upon, and a new decision reached. We shall see when we come to discuss the relation of the *mission* to *orders* what principles should guide us here.

An immediate mission, whether it grows out of our general estimate or forces itself upon us suddenly as a result of new conditions, demands immediate attention and draws to itself the whole of our loyalty—not in any sense withdrawing this loyalty from the general mission, but presenting a new channel through which it flows. We concentrate all our resources, then, upon the accomplishment of this mission, directing our efforts along the lines of the decision which develops from the immediate mission.

We have seen the importance of guarding against a too narrow limitation of our mission. But we must remember that it is of not less importance to guard against projecting it too far. In the usual case, where we are acting under instructions, these instructions will define the bounds within which we are to act. The task assigned to us will usually be only a part of the larger task included in the mission of the higher authority—one of many factors in

the decision under which he is acting toward the accomplishment of his mission. Included within the larger purposes at which he aims, and embraced within the wider field with which they deal, there may be other tasks for us, but their assignment and their definition lie within his area of responsibility and outside of ours. It will be his duty, at the proper time, to coordinate those tasks with the tasks assigned to his other subordinates so that all shall be directed toward the accomplishment of his more inclusive mission.

Each subordinate commander takes the task assigned him as his mission, estimates the situation, reaches a decision as to his course of action, and hands down new tasks to his subordinates, each one of whom, in turn, takes the task assigned him as his mission, and so on indefinitely.

It will be seen from what precedes that just as the mission for any commanding officer flows directly from the orders which he receives, so the orders which he issues to his subordinates flow in turn directly from his mission. Thus the mission is linked up on both sides to orders—flowing from orders received and dictating orders issued.

It is important that this relation between *mission* and *orders* be thoroughly grasped. Every military situation incident to a state of war derives its importance from its relation to the war as a whole. The most successful conduct of war requires that each act of war be directed towards the attainment of the object of the war. War is not simply fighting to injure the enemy; it is fighting for the attainment of a definite purpose. And since each act of war should be in harmony with the general purpose, it is evident that there must be a supreme control to direct all of these acts. This control—in the field—is exercised by the commander-in-chief. He is cognizant of the general purpose. His plan assigns tasks to forces. The success of his plan depends upon the intelligence with which his subordinates execute the portions of the plan allotted to them. If they, on their own initiative and without necessity, change their parts of the plan, the commander-in-chief then is no longer working with a plan that is a *whole*, but with several plans of parts. The plan of the *part* may succeed, but the success may be worthless because it does not fit into the plan of the whole. These considerations make it clear why the *mission* must normally be derived from the orders, and indicate the great impor-

tance of writing orders so clearly that they cannot be misunderstood, and so comprehensively that no important detail shall be omitted. The officer who receives an order, since it is to be the guide to recognition of his mission, should find in it as nearly as possible all that he needs for such guidance. It should as far as possible acquaint him with all conditions which are necessary for an intelligent comprehension of the situation, making clear to hm especially the information upon which it is based and the end toward which it is directed; that is to say, the end which the higher authority has in view. Being thus placed as nearly as possible at the point of view of the higher authority, the officer receiving the order is in a position to accept his misson wth that combination of loyalty and initiative which is the ideal of obedience.

We shall see hereafter (in considering the Order Form) that the information above referred to as essential is included in paragraphs 1 and 2 of the form for Order-writing which has been adopted as standard; and that paragraph 3 of the same order contains the definite instructions handed down by higher to lower authority.

There are of course many conditions under which orders cannot be treated with ideal fullness and formality; but every order, however brief, whether written or verbal, must—to be an *order* in the military sense of the word—contain the essentials of these paragraphs; that is to say, it must accompany the *command* of paragraph 3 (Order Form) with a statement of the object to be attained by the order (paragraph 2), and a statement of the *information* upon which the order is based (paragraph 1).

It may happen that the conditions upon which the order was based have changed since it was issued, so that a modification or even an entire change of plan is required on the part of the officer receiving it, *to make his action contribute to the plan which he knows to be that of the higher authority.* The new situation will point to a new mission, demand a new estimate, and dictate a new decision. The new mission may replace the earlier one, or postpone its execution, or merely introduce a new step leading up to it.

An officer finding himself in this position will of course communicate with his superior if circumstances permit, reporting the new conditions and requesting new instructions; but if this is not practicable, he will modify his mission as may be necessary, *always*

in the direction of the end at which he knows his superior to be aiming. For this, his orders, if properly framed, will constitute at once his justification and his guide. If he has no knowledge of the plans of his superior, so far as these apply to a situation suddenly confronting him, he may have such an intimate acquaintance with the views of his superior and of the principles which make up the code of that superior, that he will act instinctively in accordance with these principles. A code of this character, definitely held by a superior and so fully absorbed by his subordinates that it stands for them in the place of orders, is called—for want of a better term—a "Doctrine." The subordinate who acts as thus described is said to be "indoctrinated."

There is nothing so important in war as obedience, but this does not mean mere mechanical obedience. Ask first, "What was my superior's intention regarding this order? What may have been his view on this subject? What information did he have when the order was issued? What additional information have I now? How would this information have affected my superior's order?" It is only thus that dead mechanical obedience is avoided and active obedience combined with initiative is produced.

* * *

The mission, having been decided upon, is written out clearly and concisely and forms the first paragraph of "The Estimate of the Situation."

The following are typical examples of the mission:

Mission.—To secure command of the sea.

Mission.—To capture or destroy the enemy's fleet.

Mission.—To detect and report any movement of the enemy main body from CULEBRA.

Mission.—To prevent enemy force from throwing reenforcements into GUAM.

Mission.—To capture or destroy enemy convoy and escort before they reach the STRAIT OF GIBRALTAR.

Having decided upon the mission—*what to do*—we must study the situation from all points of view as a means of arriving at the decision—*how to do it.* This part of the estimate is considered under the following headings:

2. Enemy Forces: Their Strength, Disposition and Probable Intentions.

3. Our Own Forces: Their Strength, Disposition and Courses of Action Open to Us.

Under these two headings we are to consider all conditions entering into the problem of carrying out our mission, discussing fully each course which may be open to us or to the enemy, weighing advantages and disadvantages and balancing one course against another, until we are led by a logical train of reasoning to a decision upon the course to be adopted.

It is very important that the whole train of reasoning, with all the facts, beliefs, and theories upon which it is based, be fully written into the paper. This will not always be possible in war, but we are not now conducting war, we are *training* for war; and the practice of taking into consideration every detail that bears upon our problem will lead to a habit of thoroughness which will assert itself instinctively as a feature of our reasoning even when our estimate and our decision must find their only expression in action or in orders to our subordinates.

A little consideration will make it evident that the treatment of 2 and 3 above must overlap at many points. Comparisons must be made which call for bringing our own and the enemy forces together in one paragraph; and this is true not only of the opposing forces in their entirety, but of individual detachments which may be expected to oppose each other. And the *position* of one force must usually be defined by direct reference to opposing forces. Similarly, the *aims* of one force and the *courses of action* open to it can hardly be stated without referring to the other force. It follows that, in spite of what has been said about the desirability of adhering to a standard form, we must be prepared to accept, especially at this point, a reasonable degree of elasticity in the use of the form.

The situation must be studied, as nearly as possible, from the point of view of a commander afloat. It is well to begin with a general survey of the field operations, laying out the charts of the area, indicating upon these the locations of the forces on both sides, the distances between important points, and other factors which will help toward visualizing the situation as a whole. Pilot charts, sailing directions, etc., should be studied, together with all other available sources of information. Special features will almost immediately force themselves upon the attention as

demanding consideration, and to some extent defining courses of action.

If we have already studied the field in a general way as preliminary to the choice of a mission, we here go over it again more in detail and with the added light which will result from the fact that our mission is now known. We studied the field before to decide what we would do. We study it now to decide how we will do it.

2. Enemy Forces: Their Strength, Disposition and Probable Intentions.

Under this heading we deal with the difficulties which are to oppose us in the accomplishment of our mission, and among these we must include those obstacles of wind, weather and terrain which are allied with the enemy against us.

Here we are concerned, first of all, with *information,* and secondarily with *inference.* In actual war, as we all know, information is always incomplete, often inaccurate, sometimes altogether lacking, and frequently deliberately designed to deceive. It must be sifted, weighed, tested, to determine its reliability. Even if our information is full and accurate, our inferences from it may be altogether at fault.

In drawing up problems at the War College, the information is such as would probably be in the possession of an officer called upon to deal with a similar problem in actual war.

Information of the enemy is important, but an estimate of his information of us is also important. The initiative is largely a matter of information. If we know and he does not know, that is one thing; if we know and he knows too, that is quite another thing. A problem solver must, therefore, consider all he knows of the enemy and then record all of the deductions and inferences which he adds to his actual knowledge.

The reasoning should be so arranged that each step results logically from what precedes and leads up to that which follows. *The estimate is not for the purpose of justifying a decision previously arrived at. It is a reasoned solution of a problem where each step in the process approaches a decision which, without those steps, could be arrived at by accident only.*

The effort should be, in this part of the estimate, to arrive at the enemy's point of view, to think as he would think of us; to consider all the plans that he would consider, and to estimate which

of those plans would be most injurious to us. This is the most difficult part of the estimate. The intentions of the enemy are frequently not divined. Clausewitz said: "There are always only three cases possible, and when all these have been provided for, the fourth invariably happens." Wellington said: "The great thing is to know from this side of the hill what the enemy is doing on the other."

It will not be possible in most cases to arrange the appropriate reply for all possible intentions of the enemy. But all courses of the enemy should nevertheless be carefully considered, to avoid being taken by surprise. The strategist must always be ready with a remedy for a new situation, but he will rarely issue the remedy until the situation arises. One must endeavor never to be caught in a situation that has not been foreseen and considered as a possibility. It is only by a thorough and painstaking consideration of the enemy's possible intentions that surprise can be avoided. Anyone familiar with military history knows the great moral value attached to surprise.

The following points call for detailed consideration, not necessarily under individual headings, but with full recognition of their individual significance. They are given here in the hope of insuring a full and detailed statement of the course of reasoning in the *written* solution of the problem. It is not assumed that they cover all the points to be considered.

(a) Position and strength of enemy forces as far as can be inferred from information available.

(b) Elements of time and space which govern the situation and affect the enemy's possible movements, and his possible whereabouts after certain intervals of time.

(c) What will the enemy probably take as his mission?

(d) What courses of action will he probably consider as leading to the accomplishment of his mission? Discuss the advantages and disadvantages of these courses from the enemy point of view, including logistics, weather, the reply which he foresees that we may make, etc.

(e) Which of these courses will he probably adopt as his initial plan of campaign, and why?

3. Our Own Forces: Their Strength, Disposition and Courses Open to Us.

Under this heading there should be a thorough examination of all courses of action open to us which lead toward the accomplishment of the mission. All other courses, however attractive, must be discarded.

Each course of action should be clearly outlined and definitely considered. Having clearly outlined a course of action, examine it. Does it accord with the mission? What is its prospect of success? What will be the penalty of failure? Does it build for the future? Is it what the enemy will expect? What can he do to defeat it? Arrangements for the sure attainment of the *mission* are of first importance, *then,* for an attainment of the mission by methods that will bring the maximum ultimate profit.

The following are among the points which should receive attention. In whatever way they may be grouped, the written discussion should make it clear that they have all been considered:

(a) Position and strength of our own forces.

(b) Compare (a) with strength and distribution of enemy forces as already outlined, and consider the elements of time and space which enter into our own and the enemy's possible movements.

(c) In view of our mission and of the strength and disposition of the enemy forces, and his probable mission, is our task offensive, defensive, or offensive-defensive?

(d) What courses of action are open to us *as leading to the accomplishment of our mission?*

(e) How are these courses affected by the mission which we have considered as likely to be adopted by the enemy and by the initial plan which we have assumed that he will probably adopt?

(f) How will these various courses stand if the enemy's initial plan is different from what we have assumed it as likely to be?

(g) What reply can the enemy make to each of the courses outlined in (d) as open to us?

(h) What difficulties, other than those directly connected with the enemy's forces, will be encountered in the various courses outlined in (d)?

The influence upon one's own plans exerted by the conclusions formed concerning the enemy's probable intentions varies greatly according to the situation. *A commander should endeavor always to keep the initiative*, and this can only be done by acting aggressively. In war it is better to lead than to follow suit. A commander whose mission makes offensive action desirable and whose force is greatly superior to the enemy's clearly should not permit the enemy's movements to change his general plan of action. On the other hand, the dispositions of a commander, whose mission is strictly defensive, and whose force is greatly inferior to the enemy's, may be considerably affected by the movements of the enemy. So long as possible, however, *a commander should keep the reins in his own hands.* His mission, and not the enemy's movement, should as long as possible be considered the governing factor.—CAPTAIN R. S. FITCH, U. S. Army.

When all reasonable courses of action have been examined and compared, one of them is selected. Thus we reach a ***decision*** as a result of a logical process of reasoning, which process is so fully set forth that its reasonableness is apparent not only to others who read our estimate, but to our own minds as we review it.

If the nature of our problem is such that an *immediate* mission grows out of our estimate, it is at this point that we shall recognize it. It will, in fact, appear as a part of the decision, as in the illustration already given, where a mountain pass is to be captured as the first step toward the capture of a city. In this case we proceed now to a new estimate of the situation growing out of the new mission.

The decision, then, is the plan decided upon for attaining the mission. It outlines a definite plan for the use of the forces available. The decision once reached must be unwaveringly carried out with our whole energy. Buddecke says that this unwavering execution of a decision once reached " is of such great importance in tactical affairs that the best course of action, if carried out half-heartedly, will come to naught, while a mistake in the choice of course can often be entirely offset by decided and confident action."

The ***decision*** must not betray indecision. The decision is the basis of orders to be written to subordinates. These orders must show resolution. " Resolution is not a heaven-sent gift. It is a quality of mind, the product of keen desire to perform a certain act, and the sure knowledge how to accomplish it."

Ingelfingen says: " Indecision on the part of the commander-in-chief may quickly destroy the powers of the troops and render

in a short time the whole army unfit for battle. Hence in war it is better to undertake something with firm determination than to vacillate hither and thither, order, counterorder, disorder. In war we should adhere to what we see to be good enough and not be led astray by seeking for something better."

Dodge says in his life of Napoleon: "Many a general fails by forgetting his first and better intention, and being led astray by an unimportant gain to do what is not in natural strategic sequence. A sense of proportion, of the relative value of things, is one of the highest qualities in the captain as in every other workman."

Captain Eltinge in his Psychology of War says: "The leader whose ideas are not clearly defined and whose intention is vacillating will get only half-hearted action from his troops, while, on the other hand, a determined man who has one clear idea will himself be surprised to see how the troops respond."

Grippenkerle says: "*Arrive at a definite decision.* . . . . I warn you against half-measures. For example, if you have decided to attack, do so with all your troops; if you wish to retreat, do not come to a halt again after a few miles without the weightiest reasons. *Be perfectly clear in your own mind what you want to do,* and then carry it out to the letter."

In the solution of problems at the War College, as in the actual practice of war, the need of a ground work of sound military knowledge is constantly experienced. If it happens that a strategic problem is presented, there is a demand for knowledge of strategic principles. If it is a tactical problem, then tactical knowledge and experience are required. It is quite natural for a beginner to feel that there should be some guide to his first efforts. So far as *form* is concerned, this demand is reasonable, and is easily met by the issue of a few simple problems with solutions in correct form. More than this the college cannot offer in the shape of definite instructions. It has no code by which naval warfare is to be conducted. It presents no rule for meeting any single one of the situations which may arise during the progress of a war. It would manifestly be impossible to formulate such rules, for the reason that the problems which arise in practice are infinitely varied in the character and significance of the factors which enter into them. This is true not only of conditions which have to do with the material forces involved and the features of wind and weather and terrain, but with the intellectual and moral forces of

the personnel. Thus each problem must be dealt with on its merits, in accordance, however, with certain general principles, the recognition of which is one of the objects of our studies. The college aims, then, to furnish, not rules, but principles, and to develop a habit of applying these principles logically to each new situation as it arises. It offers not a set of precepts, but a course of training. It presents for study a series of problems illustrating situations such as might arise in practice, and which are regarded as involving instructive principles of strategy and tactics. These problems are studied carefully, and each officer presents what, for want of a better term, is called a *solution;* but it must always be recognized that neither the result thus obtained nor that obtained by maneuvering on the chart or on the tactical board is a "solution" in any sense of finality. For every problem of this character which can be devised, there are many possible solutions, and no one of them is so good that we can safely say that it is the best possible. In a large number of proposed solutions, however, we shall recognize many degrees of excellence, and it will sometimes happen that one of these will stand out as manifestly the best of those *under consideration.* Whatever their degree of excellence may be, all are acceptable if they start from sound premises and proceed by logical reasoning to a sound decision.

Each problem given to the class is considered very carefully by one or more members of the staff, and a staff solution is prepared. This differs from the solution prepared by members of the class only in the fact that it is usually the work of an officer of considerable experience, having the advantages of consultation with other members of the staff, all of whom are supposed to be "indoctrinated" with principles which are believed at the War College to be sound. All that is claimed, therefore, for the staff solution of any problem is that it is a sound, or, as it is more commonly called, an "acceptable" solution—not that it is necessarily better than all or any of those among the class solutions which are found to be also acceptable.

The following tactical problem, with solution, illustrates in a brief form the general character of the estimate. Strategic problems, covering the ground much more fully, are issued by the War College to officers in attendance on its course, and to those taking the correspondence course.

TACTICAL PROBLEM

BLUE SITUATION

Motives.—Estimating tactical situations. Attack on convoy under escort.

General Situation.—War exists between Blue and Red. A Blue force of 4 AAs is operating to intercept and destroy a Red convoy that is known to be proceeding to a base 100 miles eastward of Blue's position at 8 a. m. Blue knows that Red has at the base a force of AAs and Vs, the AAs of inferior speed to Blue AAs. Blue also knows that the escort for the Red convoy is composed of BBs. Red BBs are inferior to Blue AAs in gun power, but are superior in speed and torpedo power.

Special Situation.—At 10 a. m., Blue, steaming east in column at speed of 21 knots, sights smoke bearing SSE, distant about 15 miles, and on investigation finds this to be an enemy force of 5 BBs. At the same time, Blue makes out on the horizon to southward another heavy smoke. Weather is fine, wind east, moderate sea.

Required.—Blue commander's estimate of the situation.

Assumptions.—1. BBs have ¾ life and 80 per cent gun power of AAs. At 6000 yards range or less, BBs and AAs have equal life.

2. AAs have 21 knots squadron speed, maximum individual speed 23 knots. BBs are know to have from 23 to 25 knots speed.

3. AAs have two torpedo tubes, one reload, 30-knot 6000 yard torpedoes.

4. One hour required to get radio message through to Red base.

NOTE: AA = Dreadnought.
BB = Battle cruiser.
V = Destroyer.

ESTIMATE OF THE SITUATION

Mission.—To capture or destroy the Red convoy.

Enemy Forces.—Their strength, disposition and probable intentions.

The enemy escort of 5 BBs is about equal to our force in gun power but is inferior in protection. Normally its speed is superior.

but as the escort and convoy have been proceeding in company at slow speed we have good reason to believe that for a time at least our speed will be superior. The escort is now concentrated and (apparently) about 10 miles distant from the convoy. The enemy commander may decide to call the convoy near the escort, or he may disperse the convoy and move with the escort to meet us, hoping to decide the issue before we can reach the convoy with any of our force. This latter course would seem to be the more attractive to him, for he may hope, even if defeated, to be able to cripple our ships and thus delay their attack on the convoy till reenforcements can reach him from his base 100 miles away. If he remains concentrated, we have a good chance to get at least one ship around his defence; so he will probably divide his force if we divide ours for a dispersed attack.

Our Own Forces.—Their strength, disposition and courses open to us.

Our own forces are strong enough to have a good chance of success in engaging the enemy escort, but the chance of having our speed reduced by a severe action, and the delay in getting at the enemy convoy which would result from this, may prevent the success of our mission, which is *to destroy the convoy*. Our objective being the convoy, how can we best move to bring destructive force against it? We must take advantage of our presumed temporary superiority in speed, which will continue less than an hour, and of the limited time we are free to act before enemy reenforcements can reach him, keeping in mind the fact that even a single unit of our force, brought into contact with the convoy, can do much, if not all, that is necessary, to accomplish our mission.

There are two general courses open to us:

1. To hold our force together and direct it against the convoy, accepting engagement with the escort only if forced to do so, as we almost certainly will be.

The disadvantage of this course is that we will in all probability find the enemy force thrown directly across our path, while the vessels of the convoy scatter on courses which carry them away from the escort and from us. In the engagement which must ensue, we have a fair chance of winning, but at a price in loss of time and in reduction of speed which will leave us little hope of seriously damaging the convoy.

2. To divide our force and endeavor to get one or more ships around the flank of the escort and in touch with the convoy before the convoy can scatter so widely as to make pursuit ineffective against any considerable number of its units.

This plan has the disadvantage that, in dividing our force, we run the risk of having it crushed in detail. This risk is the more serious because the enemy ships will, within an hour, have a small superiority of speed, and because, moreover, they can expect assistance from the base within from four to six hours. It offers, however, the best possible chance of reaching the convoy before it is widely scattered. And while it is true that the enemy may concentrate against one part of our force, he can do this only by neglecting the other part, thus presenting the opportunity which we seek, and for which we are ready to pay the price—the opportunity of reaching the convoy in time to capture or destroy it.

Decision.—To make a dispersed attack on convoy at maximum individual ship speed.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

UNIFORMITY: ITS RELATION TO CONTENTMENT AND EFFICIENCY

By LIEUTENANT ERNEST DURR, U. S. Navy

Motto: The ratio of achievement to effort is the true measure of efficiency

A newly commissioned ship requires a comparatively long time for shaking down. In event of war can a new ship or ships in reserve or in ordinary be whipped into shape in time to take their places in the fleet with personnel, both commissioned and enlisted, sufficiently trained to inflict damage to enemy ships commensurate with the offensive power of the material?

If the answer is in the negative, the weakness must lie in the absence of recognized uniform principles of command, administration and organization. The fault will reappear on board any ship where men are replaced for any reason. The evil effect will be intensified in time of war when recruits and Naval Militia must be employed.

It is generally conceded that something vital is lacking throughout the service. Whatever this may be and whatever remedies may be proposed, the immediate concern of the service is with the situation as it is and not as it should be. "We must do the best we can with what we have at hand."

It is improbable that a system of command and organization can be made sufficiently rigid to suit all ships, but enough can be done so that officers and men transferred from one ship to another will always find sufficient similarity on ships of a type to obviate the necessity of learning a new system before they can commence the real work of preparation for battle.

A diversity in methods was necessary for rapid progress during the period of evolution from sails to machinery. The navy has safely passed through this period, and in the process enough excellent ideas in command, administration, and organization have been developed to show the necessity for and the practica-

bility of uniformity on board ships of a type which will permit officers and men, once trained, to fall into place instinctively.

Under existing conditions subordinate officers must serve an apprenticeship under many executive officers, some of whom may have radically different methods. Undoubtedly such subordinate officers have a great advantage in their training in the opportunity to note, compare, and select the good points in the methods of many seniors.

Speed in organization is a prime requisite in all military operations. Since our four-year term of enlistment compels frequent changes in the personnel of ships, it is probable that our crews as units are not as capable as those of nations whose term of enlistment is two or three times longer. The individual American bluejacket is superior to any individual foreign bluejacket, and we should simplify and standardize organization, command and administration to develop speed in order to utilize superior individual ability to counteract the disadvantage of a short enlistment.

The organization, administration and preparedness of the fleet for the conduct of a campaign depends upon the preparedness of the ship. It is said that a captain's first duty is to his ship. In view of the complexity of modern tactics, battle exercises and the absolute necessity for intelligent and concerted action in the handling of the fleet both tactically and strategically, this is open to question. It appears equally if not more important that a captain devote his best efforts to further the plans of the commander-in-chief. A completely organized and highly efficient ship does not, in itself, contribute sufficiently to the plans of the commander-in-chief. The increase in the size and in the complements of ships, the use of radio, and the greater speeds developed in the evolution from the old to the new, have increased the sphere of a captain's activities until his duties in the fleet as well as in ship have grown to such magnitude and importance as to justify twice the attention he can pay to either.

A recent commander-in-chief of the Atlantic fleet was ordered to the *Chicago* as a watch officer when that vessel was new. On reporting for duty he was so impressed with the great size of the *Chicago* that he believed her to be too large for one man to command. Since that time vessels five times as large as the

Chicago have been built. Yet one man *must* command with not much change in methods or responsibility.

It is not overdrawn to say that the captain and the executive officer of any ship in time of war will require physical and mental endurance of the highest order. Many of our captains have passed the prime of life with ability on the increase but with endurance on the decline. Younger captains may have endurance, but will they have the ability that comes only from experience? Whether captains are young or old, they and the executives should be relieved of many of their duties if they are to devote their best efforts to campaign and battle and at the same time have a reserve of energy and endurance when most needed.

In 1912 the Chief of the Bureau of Medicine and Surgery reported upon the lack of snap and vitality in the officers and men of the Atlantic fleet. This condition was attributed to the high nervous tension caused by continued day and night drills. In the opinion of some competent observers the state of efficiency of the fleet warranted more drill. If the personnel can be taxed to such an extent in peace, then what can be expected in war?

Increased opportunity for diversions ashore was advocated as one remedy. Without doubt such diversions are to be desired if in themselves they do not aggravate the evil they are intended to correct, and do not encroach on the time necessary for drills. Another remedy was the promulgation of a fleet schedule to be known in advance, and the elimination of useless work and unnecessary irksome features of routine afloat. The gain in time for both work and play under this remedy is apparent. In view of the different degrees of contentment and efficiency existing on different ships in the same fleet, reform should begin at home, *i. e.*, in the ship.

The greatest obstacle in the path of reform lies in the difference of opinion among commanding officers as to what features on board ship can be considered useless, irksome and unnecessary. However, this question could be settled in a logical, progressive and satisfactory way by a heretofore unused principle of competition in target practice and steaming trials, namely: the adoption of an equable rule whereby the time, counting from the receipt of the order to hold a target practice or a steaming trial to its completion, shall be a definite and appreciable factor in determining a ship's final multiple. Such a rule would encourage a routine in

which sudden and radical temporary changes would be unnecessary. Preparation would at all times be the work of the day, and actual trial would soon demonstrate whether or not any present practices could be advantageously eliminated.

In organization and mobilization for the conduct of a campaign, the speed of the fleet depends upon the speed of its units. Success in battle will be largely affected by the contentment and physical fitness of the personnel of ships who will be subjected to a drain on energy and endurance during campaign, especially if prolonged. The need of uniformity to produce speed and lessen work needs no further words.

In the following an attempt will be made to set forth in concrete terms a few ideas derived mainly from abstract discussions of military principles. No claim is made for originality. It is hoped that the impression will not be created that the writer advocates nothing but less work. A minimum input in effort and a maximum output in results is strongly advocated, and if less work (and more play) is the result, so much the better.

Many of the ideas have been tried on board ship with most encouraging results. Special consideration has been given to the subject from the viewpoint of division officers for the reason that if they are encouraged to take as much interest in their divisions for campaign and battle as they do for target practice, success will be assured.

The first essential for uniformity in organization is simplicity. Both uniformity and simplicity in command and administration require nothing but adherence to four simple rules:

1. No officer or man will be required to serve two seniors at the same time, if it can be avoided.

2. Authority for the control of the details of administration must be delegated to subordinates.

3. After an equable division of authority, no division of responsibility for the authority thus conferred must be permitted.

4. No officer or man is to be interfered with in the exercise of his authority unless danger or injustice renders such interference expedient, or, after instruction and fair trial, incompetence is shown.

Adherence to these rules will teach subordinates the correct meaning of responsibility, and will provide a simple, progressive method of education for succession in command. The advantages

to be derived therefrom cannot be overestimated. If, in the every-day performance of duty, warranted interference with subordinates is followed by kindly instruction, authority will be more firmly intrenched, competence will be developed, and seniors will be relieved of worry over many little details. At present, authority is feared rather than respected, as is evidenced by the periodic anvil chorus of criticism that breaks out in almost every ward room and junior officers' mess. This regrettable hostility can be partly eradicated by education. Without education, it can be eradicated only by ruthless and arbitrary measures by senior officers, who naturally hesitate to cast the first stones because they have not been without sin themselves.

The need of conformance to the first of the above rules is brought home by a superficial examination of conditions on board ship. The executive officer is the captain's direct representative in maintaining the military and general efficiency of the ship, and he arranges the drills and exercises of the crew. The first lieutenant is responsible for the cleanliness, construction, and equipment. The gunnery officer is responsible for the ordnance equipment and electrical installation outside the dynamo rooms, and has delegated authority over officers connected with the armament at drills and exercises. Since the first lieutenant and gunnery officers are heads of departments having free access to the captain, their own duties are naturally first in their minds. Division officers have duties under all three, and their men often work under petty officers other than their own, as for example, compartment cleaners and messmen under masters-at-arms.

Granting that this division of duty is satisfactory to heads of departments, is it fair to division officers and men, who, having had nothing to say in the matter, must silently try to disprove the biblical proverb that "no man can serve two masters"?

Is it not probable that the wasted effort caused by too many masters is responsible for some discontent? Specialization seems to have been carried to an extreme in the cases of the first lieutenant and the gunnery officer. These officers would be better educated to step into the executive's shoes on the same or on another ship if they were held responsible for the whole of a part instead of part of the whole. Responsibility for the whole of a part in administration in the engineers' department is practicable and successful because, to a great extent, the management is simi-

lar to that of a large industrial plant. Under the chief engineer, one officer is responsible for the engines, another for the boilers, and another for the auxiliaries. These officers are practically managers, and the primary duty of other officers and men under them begins and ends with them.

A casual review of the progress made in the past indicates that specialists in any branches of the naval profession are desirable only in the lower ranks. As officers advance in rank and experience the tendency to specialize in any particular is submerged in the general specialty of commanding. Highly ranking specialists are not often found afloat, and when found the specialty is seldom in evidence. In other words, it is better to be an expert in handling men than in handling material.

On board small ships where the executive officer is also first lieutenant and gunnery officer, routine and administration are usually carried on more smoothly than on board large ships. If less friction results because there are no excess masters, the same happy state of affairs can be arrived at on board the largest ship afloat by distributing duty and responsibility accordingly. A reclassification of the duties of various officers is suggested along the following lines:

The captain should be supreme, as he is now, and responsible for his ship as a whole. He should be free of individual responsibility for the mass of detail imposed upon him by present regulations in order to devote his best efforts to inspection, the administration of justice, the enforcement of discipline, and the study of war.

The executive officer should be the internal captain of the ship and responsible to the captain for all or nearly all of the details for which the latter is now held responsible by regulations.

For reasons of expediency, the navigator, chief engineer, medical officer and general storekeeper should be considered as heads of departments. The first lieutenant and the gunnery officer should lose their individuality as such. Under the executive officer each should perform all of the duties of the executive officer, first lieutenant and gunnery officer for half of the ship. They might be designated as sub-executives or as first lieutenant and second lieutenant. The name is of small consequence. Each would have division officers as assistants to be responsible for the care and preservation of material, for the cleanliness and good condition of subdivisions of the ship, and for the stationing, drill, instruction and appearance of the men under their command.

Temporary difficulty would be experienced because officers and men have not been brought up on such a system. Any other objection seems untenable. If one officer can handle the situation on a small ship, then two or three of equal ability can handle it on a large ship.

Of course, watch duty must be subordinated to division duty. If training for war is an officer's real business there is no reason why this should not be done. Division officers learn to command in division duty. More seamanship is learned in a month handling a torpedo-boat or a steam-launch, combined with a month's watch standing at sea, than in five years' watch standing in port. The first meaning of "responsibility for the safety of the ship" is learned at sea. On board a large ship, in port, the area of duty of the watch officer is usually limited to the quarter deck. Such simple duties as carrying out the boat schedule, rendering honors, making routine reports, transmitting orders, etc., cannot be considered equal to duties to men, armament and equipment which require higher ability and more time.

Whatever difference of opinion may exist on this subject, a brief review of the progress made by division officers during the development of the present system of target practice, should convince the most skeptical that if division officers are given sufficient authority and held rigidly to account for it, they are capable of relieving seniors of many details of duty which rightfully should be performed by subordinates. Under existing conditions division officers are to a large extent deprived of the joy of accomplishment in all duty except target practice.

The everyday administration of justice is a tedious affair. Considering the number of vexatious and trivial reports at the mast, day after day, it is a wonder that captains do not completely lose their tempers and patience. The fault lies with an antiquated system of administration of everyday affairs which compels officers to make reports for many trivial offenses which could be settled without punishment. Of course, reports are largely a matter of personality and good judgment. But if such delinquencies as dirty uniform, slovenly at drill, slow in obeying, shirking, etc., were wholly within the province of the division officer, it is very probable that the captain would not be disturbed unless the offense was such an aggravated case as to merit a court-martial. Actual trial has demonstrated that such offenses are lessened when

chronic offenders are discriminately classified and placed in squads designated as the sloppy squad, extra drill squad, and unfinished work squad, and made to undergo the inconvenience of extra inspection, extra drill, or of completing unfinished work, as the case may require. Such methods are far more effective than nominal punishments. The wholesome effect is not lost on men inclined to similar faults. Contentment is promoted. The division officer simply requires men to do what they have left undone, and many men are not inconvenienced for the faults of a few.

Paul Jones threw the cat overboard. The following extract from one of his letters to Mr. Hewes, at the birth of the American Navy, affords an insight into the methods of a master seaman:

> Coming to view the naval officer aboard ship and in relation to the men under his command, he should be the soul of tact, patience and charity. No meritorious act of a subordinate should escape his attention or be left to pass without its reward, even if the reward be only one word of approval. Conversely he should not be blind to a single fault in any subordinate though, at the same time, he should be quick and unfailing to distinguish error from malice, thoughtlessness from incompetency and well-meant shortcomings from heedless and stupid blunder. As he should be universal and impartial in his rewards and approval of merit, so should he be judicial and unbending in his punishment or reproof of misconduct.

Those among us unfortunately unblessed with these virtues are hindered in imitation. The higher ranks have no time. The lower ranks are restricted. The result is that the field of endeavor is continuously open, few having thoroughly and minutely explored it.

Having touched upon administration, and its control, let us turn to organization and its resultant, routine. Contrary to the general idea, it seems that the control of the framework of organization should be centralized in the captain, or his representative, the executive officer. If all divisions were organized by division officers with as much freedom as the engineers' division is, a fruitful source of discord would be originated, because coordination of component parts, the most difficult feature of organization, would be complicated.

For illustration, let us assume that the fleet as it is to-day will to-morrow engage in a campaign against an equal naval power that may last for six months or a year, and that during this period we may expect battle at any time and that occasional brushes with the enemy will be the rule rather than the exception. This is not improbable according to the history of the Russo-Japanese War.

If the executive officer and a few leading spirits of a ship were killed in a minor engagement, a new executive and new leading spirits might be obliged to study the methods of defunct predecessors before the ship could do her best in the big battle which might occur the next day. A first lieutenant or a gunnery officer previously occupied in his specific duties would be very little better qualified to succeed in all of the duties of command than a new officer.

It is probable that the fleet will rarely anchor, and then only for short periods. A watch in four under such trying conditions will tax the endurance of all hands to the utmost. Hence the problem in organization is to eliminate everything interfering with comfort and contentment, that is not necessary for discipline and efficiency, and to minimize the dangers of exhaustion. Such features are as desirable in peace as in war.

The essentials in a ship's organization during peace for the conduct of a campaign are:

(1) Battle drills, (2) coaling, (3) boating, (4) messing and berthing, (5) cleanliness, (6) collision drill, (7) landing force, (8) study and instruction.

These are mentioned in their order of importance. Battle drills include torpedo defense, the handling of torpedoes and mines, and fire and collision drills as contingencies in battle.

Abandon ship as a drill is omitted because it is a waste of time. Viewing it from a point of safety, most men would prefer to take the chance offered by a life belt and previous instruction in swimming. The lack of sufficient boats will compel some men to take this chance. Besides, proper attention to fire and collision drills will preclude the necessity for abandoning ship.

Fire drill as a separate feature of organization is omitted because it seems unnecessary. There can be no situation in which a fire will be more disastrous or of greater intensity than one caused by shells in battle. As a separate drill, the only modification necessary to the procedure in battle would be to require divisions in the unendangered part of the ship to assemble at quarters equipped with fire-fighting apparatus ready to assist the endangered part. It is a good test for fire hoses and plugs to couple up every one in the ship and to turn on the water. It also blows mud out of the fire main, but it reminds one of the situation in a civic community where every man turns his hose on his own house, though the fire may be miles away.

Organization for collision as a distinct feature is probably also unnecessary. Since preparations are, as far as possible, made before going into action, the conditions of collision at other times may be entirely different. On this account it seems desirable to provide a distinct place for it in organization. But the procedure in general should conform to that in battle, because no mishap in battle may be more disastrous in its consequences.

During war landing force drill could be omitted. While absolute control of the sea remained in doubt, there could be no occasion when it would be justified to expend good sailors (who would be scarce) in the work of soldiers. Study and instruction can always be carried on to suit the occasion, whether in peace or war.

Cleanliness deserves a place in the list next to battle, because there are too many recognized and unrecognized germs floating about ready to enter a man's system with a fragment of exploding shell. It is necessary for comfort, health, self-respect, and the development of a fighting spirit.

Boating is considered third in order of importance chiefly in its relation to the transportation of working parties, stores, provisions and ammunition when supply ships cannot go alongside. The importance of coaling, messing and berthing in organization for war needs no mention.

The necessity for centralized control of the framework becomes apparent after consideration as to when and under what circumstances any and all of the occurrences before mentioned can take place. Battle may take place at any time. Attack is the best defense against attack, but a time must come when the need of coal, stores or repairs will compel a ship to retire. The temporary absence of a ship, if known, might invite attack upon the main body. If the base were poorly defended or if it depended on the fleet for protection, ships in it would probably be attacked. Consequently the possible absence of working parties or of boats on picket duty should be foreseen and carefully provided for. Each part of the organization should naturally support the other parts. Similarly in port in time of peace the absence of one-half or three-quarters of the crew on liberty should be foreseen, so that in case of fire and collision immediate and thorough action would be taken by the men available.

If men are given gun stations by watch numbers with other stations corresponding to the gun stations, rigidity is necessary for support and to prevent confusion. A constantly changing personnel and the advent of modern gunnery has shown that rigidity, exemplified in the old sailing ship organization, is impossible. The regulation requiring the executive officer to inform himself of the capacity of the crew is impossible of execution, except possibly in the cases of petty officers. He cannot by himself intelligently station men at the battery. Permanence at gun stations is a myth until the right men are found for the right stations. The only man who can find the right men is the division officer. Assignment of men to gun stations by watch numbers is a cumbersome procedure and should be abolished. A number does not identify a man as well as his name, and it cannot locate him to best advantage in all of the duties called for by a gun station.

The following are concrete examples of some faults encountered in the past. Similar ones are probably in the remembrance of many officers:

In one case there were practically two sets of gun's crews, one for target practice and the other for general quarters. The semblance of good order in other drills was possible only by constant and unremitting attention to detail.

In another case the companies of the landing force were made up of gun's crews selected hap-hazard from different divisions. Company officers rarely had all of the same men twice in succession. A simple remedy would have been to make up the unit of landing force from gun's crews from the same division. The control, drill, instruction, equipment and embarkation of each unit under its officer would have been a simple matter.

In still another case a horde of about 100 coal passers, without a single officer or petty officer from the engineers' division, were sent to the powder division for battle drills and fire and collision drills. The ignorance of station periodically displayed among these men seemed to indicate that posted station bills and the mere location of ammunition hoists, fire plugs and water-tight doors were too complex for the understanding of the average coal passer.

Such a state of affairs shows the need of more uniform control by the executive officer over the engineers' division in military

matters. If the executive officer assigns men, guns, equipment and territory to division officers with the injunction, "get busy and organize," there is danger of non-uniformity throughout the ship, and the lack of coordination in divisions.

The weakness lies in the fact that the division is treated as the unit of organization. The true unit is the gun's crew. The division should exist for administrative purposes only. The weakness can be obviated if gun's crews or groups of gun's crews are assigned to duties, the relation of one group to another being clearly defined. Here the detailed control of the executive officer should end. Then if men are turned over to the division officer he can go ahead and station them at the battery according to their qualifications, and at the same time station groups of men (containing competent leaders and individuals for specific duties) at other drills. In other words, the man goes to the duties of a gun and takes his other duties with him. Interference is reduced to a minimum. Flexibility and freedom of action permit the division officer to change men as they are developed in drill, to bring his battery to the highest point of efficiency by finding the right men for the right gun stations. At the same time he can avoid or reduce to a minimum changes of station at other duties where a man may be already in the right place, simply because the duties are included in those of the group to which both gun's crews belong. This is possible within limits which should have as wide a range as possible. Any one who has been caught unprepared for admiral's inspection after a strenuous period of preparation for target practice will readily appreciate the advantages of such a scheme.

Each gun's crew should consist of an equal number of men from each section of a division. Each group may consist of one or more gun's crews or of a part of a gun's crew. The least number of men to constitute a group should be four, one from each section. For example, there are four water-tight doors or four water-tight hatches to be closed in some emergency. Instead of one man closing each door or hatch, four men close the four in succession; the idea in general being to provide men to perform all of the duties of a group in case a part of a group were unavoidably absent, and to minimize the need of attention to detail.

If during peace the ship's routine is conformed to organization for war along these lines, instead of conforming organization to

peace routine, there can never be any situation in peace or war, work or play, in which coordination will not be automatic.

The objection that such a routine would prevent a fair distribution of a hundred and one daily odd jobs is a fallacy. Odd jobs can be fairly distributed by giving each division all or a part of them. The practice of sending men from each division to answer calls causes a waste of time because of the long distances men must travel on a large ship to assemble. The weekly detail of a working party is not much better. It also increases office work, the strain of which has already reached its elastic limit. Of course, the re-education of officers and men would have to be undertaken, a difficult but temporary task. Instead of stationing men themselves, division officers should train and instruct petty officers and gun captains to station, instruct, and control groups. Herein lies the secret of superiority of some division officers over others. The most successful seem to know more about details, but to do less than any other person under their command.

A petty officers' school for instruction in everyday military duties, similar to the non-commissioned officers' school of the marine corps, is a crying need. If the instruction of men in being men-o'-war's men first and specialists second is conscientiously carried out, many intelligent and desirable young Americans would reenlist who otherwise leave the service for good. Many of this class have been attracted into the service by the charm of military life as depicted in story books. There is not much charm in wielding a coal shovel or pushing a deck scrubber.

The recognition of the gun's crew as the actual instead of the incidental unit of organization will be followed by the abolition of the powder division. This was strongly urged a few years ago for excellent reasons, the principal one being better ammunition supply. The individuals of this division should be distributed to gun divisions, the surgeons' division, the fire control division, the commissary division, the navigators' division and the repair division, where they logically belong.

The employment of part of the engineers' division for ammunition supply is undesirable, but it is necessary for reasons of expediency. The difficulty and confusion occasionally experienced by sending a large body of men to the powder division can be minimized by sending groups to guns to augment ammunition

crews. If such crews are not needed in the engineers' division during fire and collision drills, their value can be enhanced by association with gun's crews during these emergencies. The military value of this division as a whole would be bettered by closer contact with the combatant features of the ship. A very simple method of doing this would be to require such men to answer at muster with the number of the gun to whose ammunition crew they belong.

In everyday combatant routine the engineers' division and the repair division introduce discord. Military considerations render a compromise desirable if not mandatory. Very little of the real work of repairs can be done before breakfast. If artificers and the engineers' division are required to knock off work to attend quarters and a general drill at 9.30, practically the entire forenoon is lost. The drills require considerable time, but the great loss is in the cumbersome process of starting and stopping. If this happens twice in a week, it makes an appreciable difference in the progress of repairs.

The interference of work with drills and *vice-versa* would be minimized if quarters and drills, especially general drills, were held immediately after the breakfast tables were cleared away, having breakfast earlier if necessary. Of course this would greatly inconvenience officers who had night watches, but, as has been said before, watch duty should be subordinated to battle efficiency. Watches should be less frequent.

Cleanliness, contrary to first impressions, would be improved. It is a source of irritation to men to attend quarters spick and span and then to shift uniform to engage in dirty work or drills. Why not clean up and inspect after drills and work? Ship and crew would then receive the final polish just before exposure to public gaze.

If all of the time wasted in routine was saved, the usual day's work on a big ship could be finished by noon. Inspection could be held at 1.30. In case of special work, inspection could be omitted with no evil effect. The progress of emergency work would be facilitated by an unbroken day. All work necessary for the preservation or repair of material should be emergency work. The natural desire of all men to finish their work as soon as possible should be encouraged, and advantage should be taken of this desire.

The need of a long cleaning period before breakfast implies that dirt accumulates from one cleaning period to the next. A ship can be kept clean all of the time by not allowing her to get dirty. Human nature enters into the question as well as into other features of ship life. Remove a few causes and the effects will disappear.

Indifference to the relative location of and right of way to and from steaming lockers encourages dirt. Men performing odd jobs in parts of the ship not their own are very careless if they do not have to do the cleaning. An illuminating example is the coaling of steamers and the galley.

Cleanliness of uniform is of more importance than correctness. One produces the other, but the former is sometimes lost in a too strenuous pursuit of the latter. Dirty uniforms dirty a clean ship, and *vice-versa*. Unnecessary bright work causes an accumulation of dirty rags. A smear of polishing paste is usually discernible on bordering paint work, and when clean rain falls it creates the disagreeable impression that the ship has not been scrubbed under her chin.

Attention to the foregoing and many other similar little details will save enough minutes in a day to make up two or three hours. The cultivation of a proper military spirit among men, especially among mechanics, where it is woefully lacking, will cut out many loops in the path to better contentment and consequent efficiency.

Whether or not reform may be needed along any of the lines mentioned, many accomplished and progressive officers are united in opinion that non-uniformity in command, administration and organization is a service-wide weakness. No better first step for improvement can be taken than in the military and technical instruction of men as prescribed in General Order No. 63. Even academic instruction can be utilized to this end in the study of American history. If, in the study of campaigns and battles which is emphasized in the order, we do not lose sight of facts, we will occasionally encounter statistics as to the relative forces involved which will disturb the complacency of the average citizen and will certainly shock the sporting instinct of the bluejacket which causes him to sympathize with the under dog. The mass of American people learn history from public school text books which are all too meager as to figures, supplemented perhaps by the bombastic utterances of stump orators who are more inter-

ested in pleasing their listeners than in historical accuracy. It is not to be wondered at that many people complacently believe that America can arm with the scythe and whip the world. One generation learns the folly of unpreparedness by experience. The next generation is allowed to forget it and must pay the price in time, money and lives.

Knowledge of this sort will help the bluejacket to better himself as a fighting man.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ELECTRIC PROPULSION FOR BATTLESHIPS

By ASSISTANT NAVAL CONSTRUCTOR H. G. KNOX, U. S. Navy

The announcement in the newspapers that one of the recently authorized battleships is to be propelled by electricity marks a new step in ship propulsion and will add another achievement to the credit of the United States as a leader in progressive naval engineering. The story of the development of electricity for the propulsion of large ships is an interesting one and, now that it is here, the wonder is that it has not been accomplished before.

Many officers there are in the service to-day whose ideas of electricity were obtained when Professor M. G. Farmer at the Newport Torpedo Station was a man ahead of his time. Many more graduated from the Naval Academy before the useful applications of electrical engineering formed a part of the course. With battleships lighted, ventilated and steered by electricity; with turrets and boat cranes completely electric; with electric anchor windlasses, electric galleys and the wonderful radio, electricity is to-day one of the most vital engineering subjects in the naval profession.

Now we read that the propellers of a battleship are to be driven by electricity. No more main engines! There are only a couple of completely inclosed, turbine-driven alternators in the main engine rooms, and a motor on each shaft. With this advance comes the necessary step to alternating-current electricity, now so generally used in power stations throughout the land, but as yet so seldom used afloat.

This paper was suggested through the realization that few naval officers have had opportunity to keep abreast of the applications of alternating-current power production and transmission. In it

an attempt is made to answer, in as elementary a manner as possible, two questions:

1. Why electric propulsion?
2. What is electric propulsion?

The answer to the first question is probably well known in the service, while the answer to the second, at least as to details, is not so generally known. The first will be answered briefly by outlining certain necessary and certain other highly desirable factors in battleship propulsion and in showing how they may be obtained. In the answer to the second an attempt will be made to outline the electric system proposed, followed by an elementary discussion of the alternating-current apparatus.

The time is not long passed when a well-known commander in the navy remarked to his navigator, "Don't talk volts and vampires [amperes] to me; get the dynamo fixed and give us some light!" Such a remark in these days would hardly be possible. To-day the service is familiar with direct current, and it is hoped the term "alternating current" will not, at the outset, suggest deep and mysterious complications, because it is primarily for people not familiar with its use that the latter part of this description is undertaken.

WHY ELECTRIC PROPULSION?

Since the introduction of steam, ship propulsion in general has offered to inventors a field almost unparalleled in breadth. Jet propulsion, stern wheels, side wheels, and various freak forms of screws and propellers are all available as relics of the development.

For battleships the screw propeller and reciprocating engine gradually became standardized. The marine reciprocating engine has reached a stage of development in recent years beyond which it is difficult to go. Consequently in this field the up-to-date four-cylinder, triple-expansion, high-speed engine, with forced lubrication and superheated steam at 300 lbs. pressure, is about the last word.

On shore the steam turbine was the next step in gaining a uniform turning moment and in utilizing the energy in the steam at high vacuum. Wonderful results in high-speed turbines have been accomplished. The one phrase "high-speed" is partly the key to the situation. In fact the single-stage impulse turbine was

first in the field. The necessity of lower rotative speeds led to compounding; and the turbines, according to the method of compounding, are familiarly known by the names of the men who developed them, as De Laval, Parsons, Curtis and Rateau.

For driving ships two things are essential, viz.: low rotative speed and reversibility. The low speed is necessary on account of the poor results with high-speed propellers, and reversibility in some form is absolutely necessary. Low rotative speed at full power has been obtained by putting in turbines of many stages, and reversibility has been obtained only by putting a second turbine on the shaft built for operation in the opposite direction from the ahead turbine. Excessive multi-staging means a falling off in efficiency due to increased thermal and frictional (steam) losses, a further loss being the driving idle of a reversing turbine, when the ahead machine is in use. It is customary to run the reversing turbine in a high vacuum when not in use, but even then this idle machine running counter to its own ahead direction requires much more power than is commonly supposed. By such means the turbine speed has been reduced to, say, 300 R. P. M., with obvious sacrifices in economy, and at the same time a propeller has been developed for this speed, which is roughly twice the speed for a propeller of maximum desirability. We have therefore lost at both ends in over-all driving power per pound of coal.

This is bad enough at full power, but what happens at cruising speed of, say, half power? At this power the main turbines show no sort of economy and additional turbines have to be put in to better utilize the energy of the steam. All this is done with added turbine weight, added steam piping, with the heat losses incident thereto, and numerous large valves to open and close. The engine room contains truly a complicated-looking array.

For backing, valves must be shut, others opened, and then the relatively small backing turbines acting on the small propellers give a comparatively weak backing and maneuvering power, with much churning of water about the propellers.

It is no wonder the Navy Department was at one time forced to forsake turbines to return to reciprocating engines. It was at that time feared that the problem of economical ship propulsion was not to be solved by turbines.

The following figures, based on the reported trials of the ships listed, give at least approximate ideas of coal burned for the production of power:

		Tons coal per 24 hrs. at 21 knots.	Tons coal per 24 hrs. at 12 knots.
Arkansas, Wyoming	Direct-connected turbines	465	156
Texas, New York	Reciprocating engines	525	100

Thanks to the advances in mechanical engineering, another promising solution was offered. This consisted in designing a propeller for its best speed (in a four-shaft ship, say, 160 R. P. M.), then designing a highly efficient turbine at its best speed of, say, 2000 R. P. M. This propeller and turbine form highly satisfactory individual units, and particularly does the turbine respond to an increase in speed by a large increase in economy and greatly reduced weight and size. All that remains to be done is to couple these two units together by a reliable mechanical reducing gear. Although difficulties have to be overcome when the reduction ratio is great, large gears can be built and work at 98 per cent efficiency. The problem at full power ahead is thus perfectly solved.

Unfortunately, when it comes to cruising speed, in order to keep the water rate and the coal rate down we again have to introduce more turbines at the lower rotative speed associated with half power. Also all the while reversing turbines must be driven idle when going ahead.

A single-ratio gear with a non-reversible turbine is still not the ultimate solution.

We then turn to the automobile engineer; he has been up against the same problem. He has solved it for his little gas engines by a multi-ratio gear with a reversing combination. Unfortunately the time has not arrived when such a rig can be built for the 7000 horse-power necessary to be transmitted to each propeller.

The hydraulic engineer became interested and in Germany developed a single-ratio reversible gear with water as the working element. This, too, presents problems in 7000 horse-power sizes and has but a single gear ratio.

Such was the state of the propulsion situation when the electrical engineers were permitted to state their case. On shore the high-speed turbine-driven electric generator had made won-

derful advances. So, too, had the development of huge electric motors progressed. It seemed possible that electricity, with its single turbo-generators of 40,000 horse-power and 6500 horse-power motors, might offer a solution.

Fortunately for the navy, Mr. W. L. R. Emmet, a Naval Academy graduate of the class of 1881, and now one of the principal consulting engineers of the General Electric Company, had for years been studying the general subject of ship propulsion. As a result of his researches, Mr. Emmet had come to the conclusion that for battleships the most satisfactory means of propulsion could be obtained with what amounted to an electric reduction gear. By this means a high-speed, non-reversing turbine could be electrically "geared" to one or more low-speed propellers by a two-ratio reversing installation.

In a 30,000 horse-power four-shaft battleship, a 165 R. P. M. 7500 horse-power motor with a two-speed ratio would be put on each shaft, and would be efficiently driven in either direction with a single 30,000 horse-power 2000 R. P. M. generator. With alternating current this was easy, although many new electrical problems were presented. One generator in a single compartment was, however, a bad idea, both from a safety standpoint and from the fact that it is undesirable to concentrate all power in a single unit. Furthermore, one generator at half power would not be working at the desired high efficiency. The obvious cure was to use two 15,000 horse-power generators. With this arrangement full power is obtained by driving four shafts from two generators, and half power is produced by driving all four shafts from one generator only. This single generator will then be under full load and, by a simple pole-changing switch, will also be running at full speed at its best water rate. Power under one generator will be available for 19 knots in a 21-knot ship; and the other generator, with all of its auxiliaries, will be standing idle, ready for any emergency. Backing with either one or two generators in use simply means throwing a switch for each pair of motors, the generators with their turbines continuing to run in the same direction. When the motors are stopped by opening one switch the turbines run on at no load. Unlike other installations, as much power is available for backing as for going ahead.

Apparently this arrangement completely solved the battleship problem, and it only remained for Mr. Emmet and his engineers

to prove their figures in an actual ship and later tell the ship designers exactly how much weight and space would be saved in a battleship. Accordingly the installation was made in the collier *Jupiter,* whose building and subsequent trials and voyages fully upheld the figures of her designers and convinced even the skeptical of the possibilities of the form of propulsion used. It may be remarked that collier propulsion and battleship propulsion are vastly different matters, and that while electricity may and has demonstrated its superiority in driving a ship which habitually travels at full power, its exclusive advantages apply to battleship and not to collier work. At this point it is interesting to compare with the actual trial results on the *Arkansas* and *Texas,* above quoted, the coal consumption of an "electric *Texas*" based on the guaranteed figures of the designers. In these figures dry saturated steam at the turbine throttle is assumed.

Under the same conditions as for the *Arkansas* and *Texas* trials the figures for an "electric *Texas*" would be as follows:

Tons of coal per 24 hours at 21 knots	400
Tons of coal per 24 hours at 12 knots	80

Again comparing this coal consumption with the *Arkansas,* the "electric *Texas*" at 12 knots would have almost twice the steaming radius of the turbine-driven *Arkansas,* to say nothing of the increased backing and maneuvering power.

OPERATION

As to operation, consider the "electric battleship" under way at sea, full power ahead. The port turbo-alternator at 2000 R. P. M. is electrically "geared" to the two port motors in their low-gear connection and the starboard alternator is similarly "locked" to the two starboard motors. The speed of the turbo-alternators, hence of the motors, is held constant by an adjustable, automatic governor on each turbine; so the machinist's mate doesn't have to worry about the revolutions. Nor do racing propellers have any dangers, as the motors cannot appreciably speed up.

"*Half speed*" is signalled from the bridge. The governor is screwed down to give the desired turbine revolutions. No switches are touched. The motors being electrically locked to their alternator, they, too, slow down correspondingly. In formation, by this variable frequency system, a couple of turns faster or slower are similar obtained.

"Stop!" The machinist's mate (or perhaps the electrician) on watch opens a small switch in the alternator field circuit and the power is instantly off the motors. As the load comes off, the turbine and alternator keep running just as they were, the speed being held down automatically by the governor. All power is now off the alternator, and the main motor switches may be opened without sparking, if desired.

"Full speed astern!" The reversing switch for each pair of motors is electrically thrown over to the astern position, the alternator field switch is closed, and the governor is opened up for full speed. The time taken to complete the connections was less than three seconds. Driven by the already running turbo-alternators, the large propellers instantly reverse under the powerful starting torque of the motors, and 100 per cent "ahead" power is instantly available for backing, and the ship quickly comes to a stop.

Once more on signal to stop, the field switch is opened and power is instantly off the propellers and they soon cease to revolve. Meanwhile the turbine runs on at full speed, instantly ready to take full load within five seconds. There being no commutators nor slip rings between alternator and motors, there is no sparking or visible show of the work going on within.

Having finished the full-power maneuvers, the cruising rig is put in in a few seconds. Both alternators are disconnected from their motors by opening two field and two main switches, the four motors are connected for the high-gear ratio by throwing over four switches, the port and starboard bus bars are paralleled by closing one switch, the main motor switches and field switch of one alternator are then closed, and we have the ship going at half power with four shafts "locked" together and all four motors driven by one turbine running at 2000 R. P. M. and at its best efficiency. The efficiency of the motors remains above 95 per cent under both conditions, and the ship can cruise at not over a 11-lb. (per S. H. P.) water rate under one generator between 13 and 19 knots. The advantages of the system can thus be appreciated.

The electric system lends itself readily to contactor control direct from the bridge, should this ever become a desirable feature, and in the near future we may find the bridge handling the main engines as easily as electric steering is now accomplished.

As to warming up, the turbine and generator can be warmed up without worrying the officer of the deck, and, finally, each motor

can be given a kick ahead and astern to see all clear. If the turbine is of the pressure-velocity compound type, there are no small clearances to worry about and actually no warming up required.

Such high-speed turbo-alternators are often used in power plants ashore as "stand-by" units when, under usual conditions, power comes in over a transmission line. Sometimes the power line "goes out" for some cause. Steam power must be substituted at once. A cold turbo-alternator is started up as follows:

The throttle is opened all the way as fast as possible and when up to speed and in synchronism with the other alternators to which it is to be connected, the switches are closed to the line and the machine takes its load. The warming up of a cold turbo-alternator is, therefore, in itself, not much of a ceremony.

During the maneuvering above described the alternating voltage in the leads goes up to about 3000 volts at times. Not a single one of these leads moves, however, and from the insulated bushings where the leads come out of the stationary part of the alternator to the same sort of bushings where the leads go into the stationary part of the motors not a "live" bit of conductor is in sight. Between machines and switches the leads are completely covered with an insulating material unaffected by moisture, so that if required the leads themselves could be handled while "alive" with impunity. As a matter of fact the leads are carried well out of reach in order to avoid the possibility of damage. The main switches themselves work in tanks of oil and are enclosed in wire-mesh cages with only an insulated handle coming out. This type of oil switch is the one used in all power stations ashore to-day, and the oil is used simply to help suppress the arc when the switch is opened under load. Except the two small 230-volt slip rings to the alternator field there are no brushes on the alternator, and as for the motors there are no leads to the rotors, no commutators, of course, and not even slip rings. In fact, in flooded mine levels, small motors of this type, driving centrifugal pumps, are at times called upon to run under water. This they do with no damage to themselves except perhaps subsequent corrosion of the steel parts. Similarly, the ship motor could be run in a flooded compartment without any fear of damage (except corrosion), although, due to to the friction of the water, little power could be produced.

There is no commutator on an alternator, consequently no brushes. Due to this and to its inherent characteristics, the alternator can be dead short-circuited and the current will rise only to a value which will do no damage to the machine or conductors. Another valuable trait of this alternating-current machine!

There is only one steam pipe, and that to the main turbine, which is located near the engine-room bulkhead. There will be no steam auxiliary machinery in the engine room, except the boiler feed pump, because all of the engine auxiliaries will be driven by electricity on the "electric battleship." The heated air from the enclosed alternator and motors goes directly out ventilators on the main deck through individual ducts, or this hot air, as in the *Jupiter*, can be sent under the boiler grates.

Many other details of interest could be mentioned, but after all might only serve to cloud the bigger points. In fact, with a steam power plant the whole *raison d'être* of *electric propulsion* may be summed up in a "left-handed" manner by saying that: When mechanical engineers succeed in producing a *reliable, quick-reversing, two-speed* gear capable of handling 7000 horsepower at 160 R. P. M., then the day of electric propulsion may be over. Until that time and as long as the experimental *Jupiter* continues to steam from coast to coast and to weather gales such as that of December, 1914, we may consider ourselves at the beginning of an era of electric propulsion for battleships.

WHAT IS ELECTRIC PROPULSION?

The answer to *"Why electric propulsion?"* indicates pretty clearly "What is electric propulsion?"

Electric propulsion in the proposed battleship consists essentially of a port and a starboard unit, each consisting of a turbine-driven, two-pole, quarter-phase alternator and two double squirrel-cage induction motors, and it is largely a description of these machines that forms the remainder of this paper. Direct-current field excitation, at 230 volts, for the alternator, is supplied from a turbine-driven generator in the engine room or, if desired, is obtained from the ship's mains. Conversely, the two "exciters" may be used in port to supply power to the ship's mains and thus form two valuable additions to the vessel's power plant. The motors have two possible arrangements of poles, the change from 36 poles to 24 poles being accomplished by simply throwing a switch. There is

one motor in a separate compartment for each of the four shafts. For 21 knots both turbine units are run and the four motors are used in their 24-pole rig (low gear). This reduces the full turbine speed of 2000 R. P. M. to 165 R. P. M. of motor or propeller. At cruising speeds one turbine is connected to the four motors in their 36-pole rig (high gear). Thus either turbine at 2000 R. P. M. drives four motors at 110 R. P. M. The other turbine is meanwhile not in use. When the motors are not connected, the turbine runs at no load and the motors stand idle. If connected to one generator, all the motors turn (if in the same pole setting) at the same speed, although, if it is desired to back the port and at the same time stop or go ahead on the starboard motors, this is perfectly possible. In other words, when in cruising rig the ship can be quickly started, stopped, or turned by various combinations of the four motors driven by one turbine, and power for 19 knots is available. Speed control with either one or two alternators running is entirely by turbine throttle or on the so-called "variable-frequency" principle. It is at once evident that the electricity between turbine shaft and propeller shaft simply performs the same function that a clutch and gear-box do on an automobile. The electric machinery simply makes it possible to reverse the propeller shafts and keep the turbine running in the same direction, and also gives two gear ratios between turbine shaft and propeller shafts. The electric rig does not have a "direct drive," as does a motor car, because this is just what is not wanted in a ship. On the other hand, the electric rig gives two speed ratios ahead and two backing, while the motor car gives usually two ahead (besides "direct") and one backing. Being in any gear setting with either ship or motor car, *to go faster we speed up the engine; to slow, we slow the engine.* Without shifting "gear," *speed changes can be made in no other way.* In the motor car we can at any time throw out the clutch, and leave the engine running; with the ship, we can instantly disconnect the motors electrically and leave the turbine running. In fact, the analogy between electric propulsion and automobile drive is almost exact, and the feature of speed control by the turbine governor and by no other means cannot be too strongly emphasized.

Between the exciter and the alternator there are, besides the usual protective circuit breakers, one switch and one rheostat. As has been said, the ship's circuit can be used for supplying excitation

for the alternators, or in port the exciters, which are of about 300 KW. capacity, can be used for supplying power to the ship's mains.

The four main leads from the stator of, say, the port alternator go through a four-pole switch to the port bus bars. As this switch is opened only when no power is on the system, it is of the usual knife type. The two port motors are connected in parallel and then through either one of two electrically actuated main oil switches to the bus bars. When closed, one of these oil switches connects the pair of motors for "ahead" operation; and when closed, the other switch connects the motors for "astern" operation. Only one of these switches can be closed at a time, and the closed switch is locked so that it cannot be opened until after the alternator field switch is open. This last provision makes it impossable to break the main circuit until the current in it practically ceases to flow.

In each motor circuit there is a four-pole, double-throw switch. One closed position of this switch connects the motor for 36 poles, the other closed position for 24 poles. As the pole-changing switches are never used with power on the circuit, they are simply knife switches.

When in cruising rig with all four motors driven by one turbine unit, the port and starboard bus bars are connected together. At all other times the port and starboard sides of the ship are not electrictlly connected.

As the alternator field switch, the main switches, and even the turbine governors will in all probability be electrically operated, two master controllers, one in front of the instrument board in each engine room, will suffice for handling the entire main propelling plant.

Alternating current machinery of the type used in ship propulsion is essential rugged and "fool-proof," and by interlocking the main switches no danger of wrong connections is possible. An engineer force experienced in electric work is not at all essential, as is shown by the very satisfactory results attained on the *Jupiter*, where, aside from one or two officers, there were no experienced power-plant men on board. Confidence comes quickly with experience, and the bogey of alternating current soon disappears.

To one familiar with the applications of alternating current there are only one or two new features connected with the whole design. None of the apparatus is remarkable on account of size,

and voltage is low compared to most modern power plants. In fact, the standard navy-yard voltage for generators is 2200 volts, and motors of 50 horse-power and above in navy yards are run at a line voltage of 2200 volts. The standard voltage for generators and motors in commercial power plants is 11,000 volts at the machine. To obtain this low voltage the potential is stepped down by transformers from, say, 110,000 volts of transmission line to 11,000 volts in the motor windings. In other words, electrical engineers class 3000 volts on board ship as *low voltage,* and, from any point of view, the use of such voltage is entirely reasonable.

* * *

As an aid to those not accustomed to alternating currents, a brief description of the various machines is undertaken. While it is always difficult to explain a machine to one rusty in theory, and while the field is a broad one, it is believed that at least the principles of operation can be readily understood. In so doing a knowledge of the fundamentals of direct-current electricity must be assumed.

THE ALTERNATOR

Practically all electric generators, direct-current or alternating-current, depend upon the production of voltage in copper conductors by mechanically cutting magnetic lines of force. Whether the cutting conductors move through a fixed magnetic field, as in the familiar direct-current dynamo, or whether the conductors are stationary, as the magnetic field moves by them, makes no difference. As being the ship type, the latter variety of machine will be described.

Voltage is really an "electro-motive force" and expresses electrical *pressure,* just as "pounds per square inch" expresses steam *pressure.* The *size* of the electrical current, direct or alternating, is expressed in amperes. As just said, electrical pressure or voltage is generated in a machine by causing magnetic lines or a so-called magnetic *flux* to cut a conductor. Once a pressure is produced between terminals, a current will flow in a wire if connected between the terminals. The dynamo or direct-current generator is essentially an alternator to which is added a commutator for rectifying the alternating current generated. Without the commutator the machine becomes much simpler, and particularly when the field is made to rotate and the armature

is fixed. The fixed part is called the *stator* and the rotating element the *rotor*. Fig. 1 shows the principle of a single-phase, two-pole alternator. F is the rotating magnetic field, usually built of sheet-steel discs and wrapped with wire (not shown) carrying direct current for producing the field. Every revolution

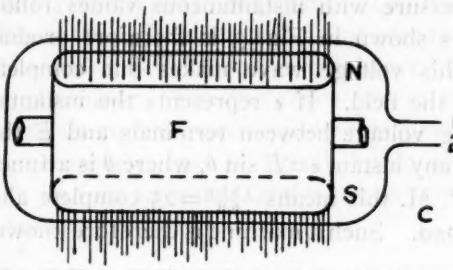

FIG. 1

of this field causes its lines of force to cut the fixed armature coil, of one or many turns, which is imbedded in the steel armature or stator (Fig. 2). The steel of the stator forms an easy return path for the magnetism from the north back to the south pole of the field, and prevents its "leaking" into surrounding space.

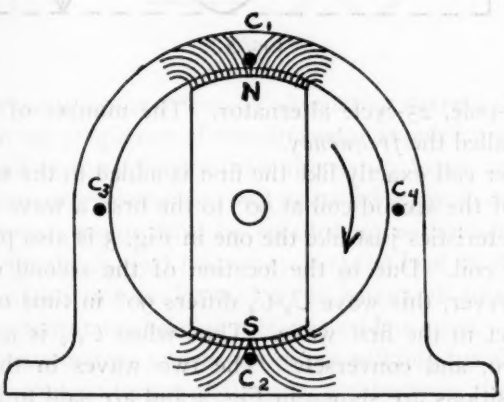

FIG. 2

The cutting of the armature conductor by the rotating lines of force induces an electro-motive force or voltage in the coil which appears across the terminals 1-2, Fig. 1.

C_1 and C_2 in Fig. 2 show the coil imbedded in the stator. When the rotating field NS of Fig. 2 is horizontal, no lines are being cut

in coil C_1-C_2; hence the voltage in the coil is zero. When the field is vertical, with N at the top (as shown), the coil is most rapidly cutting the rotating magnetic flux and a maximum voltage is produced in one direction. When S is at the top the voltage is again a maximum, but in the other direction. An alternating voltage or pressure with instantaneous values following a sine wave about as shown in Fig. 3 is therefore produced between terminals. This voltage wave makes one complete *cycle* per revolution of the field. If ϵ represents the instantaneous value of the varying voltage between terminals and E the maximum value, then at any instant $\epsilon = E \sin \theta$, where θ is a function of time. At 1500 R. P. M. this means $\frac{1500}{60} = 25$ complete alternations or *cycles per second*. Such a machine is therefore known as a *single-*

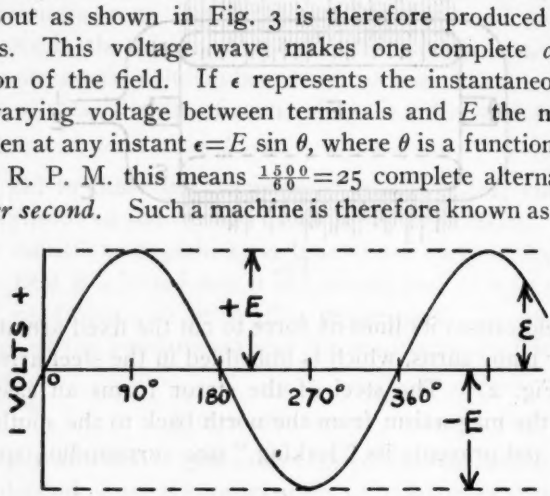

FIG. 3

phase, two-pole, 25-cycle alternator. The number of cycles per second is called the *frequency*.

If another coil exactly like the first is added to the stator, with the plane of the second coil at 90° to the first, a wave of voltage with characteristics just like the one in Fig. 3 is also produced in the second coil. Due to the location of the second coil in the stator, however, this wave C_3-C_4 differs 90° in time or *in phase* with respect to the first wave. Thus when $C_{1\text{-}2}$ is a maximum $C_{3\text{-}4}$ is zero, and conversely. The two waves in their proper relative positions are shown in Fig. 4 and are said to be in *time-quadrature*. With the addition of this second coil we have the equivalent of two separate machines in which corresponding instantaneous voltages occur 90° or a "quarter phase" apart. The two coils have no electrical connection whatever. This machine will then have four terminals and, at 1500 R. P. M., will be called a two-pole, *quarter-phase*, 25-cycle alternator. In the

design the voltage is governed by the number of turns put in series in each coil; and when completed, the voltage is regulated, at constant speed, by varying a rheostat in the direct-current field circuit. In other words, voltage depends upon the rate of cutting magnetic flux and the voltage may be varied directly by varying the rate of cutting in any way convenient. The most convenient way to do this is by a rheostat in the field circuit. More field current means a denser field, more flux cut, hence higher terminal voltage of the alternator. The *frequency* (cycles *per second*) is varied by varying the turbine speed, and by this means only. Such an alternator, conversely, may be driven by supplying quarter-phase power to its four terminals, and when so driven is called a *synchronous motor.*

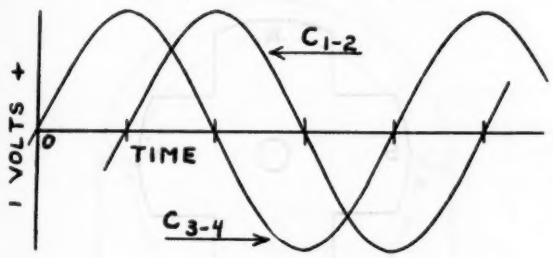

FIG. 4

A synchronous motor driven by alternating current depends for its speed on the *frequency* of the alternator supplying the current, and not at all on the voltage of the alternator; hence the electrical bond between alternator speed and motor speed is absolute. Also the synchronous motor must be speeded up without load until it is in step with the applied frequency, and the load be then put on. This form of starting under no load is impossible in most cases; hence the synchronous type of motor is seldom used.

Synchronous motors are therefore not suitable for ship propulsion, as they give no torque at starting, and because, if overloaded, they get out of step and have to be started up without load (like a gas engine) all over again. Many of the principles of the synchronous motor are, however, found also in the *induction motor,* which is the type used for ship propulsion.

An alternator with a two-pole field running at 1500 R. P. M. (25 cycles) will thus drive another two-pole alternator as a syn-

chronous motor at 1500 R. P. M., and at no other speed. This same alternator at 1000 R. P. M. will drive the same motor at 1000 R. P. M. only, and so on. If the driving alternator had a four-pole field (Fig. 5) running at 1500 R. P. M., 50-cycle current would be produced and the synchronous motor having two stator poles (Fig. 2) would run at 3000 R. P. M. only, and at 1000 R. P. M. of alternator the motor would run at 2000 R. P. M. only, etc. For ship propulsion the two-pole alternator is run at 2000 R. P. M., and is electrically interlocked to one or more *induction motors* which can be connected for either 24 or 36 poles at will. With turbine and alternator running at 2000 R. P. M. and motor in 24-pole setting, the propeller revolves at 165 R. P. M. for a speed of 21 knots. With turbine and alternator still at 2000 R. P. M. and motor in the 36-pole setting, the propeller revolves at 110

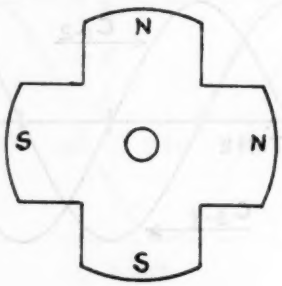

FIG. 5

R. P. M., say, for 13 knots. Remembering that 2000 R. P. M. is the turbine's most economical speed and that one turbine drives all four motors at 13 knots, the reason for low cruising water rate is apparent. We thus get the desired two-ratio reduction gear with electricity as the working medium.

For many purposes alternators are built with three coils 120° apart instead of two coils 90° apart, and when thus constructed they are known as three-phase machines. The quarter-phase type is adopted for description, largely because of greater simplicity of connections, and, in fact, a quarter-phase system may be put in the first battleship, as giving better possibilities for obtaining the desired number of motor poles in the full-power and half-power rigs.

It is likewise possible to build alternators and certain types of motors to run *single phase*, but these machines are not generally satisfactory, and a single-phase *induction* motor has no starting

torque, although when up to speed it will run and produce mechanical power. As will be explained, polyphase *induction* motors do have a starting torque and are a very satisfactory type of machine. For analogy, take a single-cylinder engine, a cross-compound engine, and a three-crank (120°) triple-expansion engine. Here we have, so far as the crank effort is concerned, one-, two- and three-phase machines, and here, too, the one-phase engine is apt to be "on the center" and fail to start.

ALTERNATING-CURRENT MOTORS

Electric signs frequently have a couple of "squirrels" running around the rim. The "squirrels" consist of a group of successively lighted incandescent lamps mounted at the edges of the

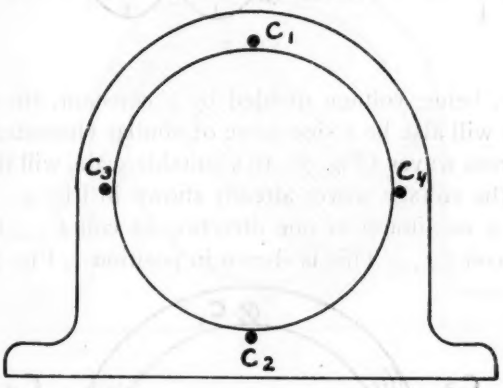

FIG. 6

sign. The lamps of course do not move, although the "squirrels" actually do travel around the edge of the sign. To produce a "squirrel" about nine adjacent lamps are lighted at once, the contact being moved on the actuating drum so as to cause successive illumination of the border lamps. If, instead of nine or ten lamps, only about six are on at one time, instead of a "squirrel" a "rat" chases around the sign. Similarly four lamps produce a "mouse." The number of "animals" chasing around the edge is limited only by the size of the sign and the size of the lamps.

The point is, we do get rotation of the illuminated section, although the lamps themselves do not move. Another familiar case is found in water waves. Here a wave may progress at considerable velocity across the ocean, yet the water particles

actually move only vertically up and down or in restricted oval paths. Take now the alternator, or motor stator, of Fig. 6, omitting any rotor, and consider terminals C_1, C_2, C_3 and C_4 to be connected with corresponding terminals of the alternator, Fig. 2. Fig. 4 shows that the voltages impressed across the ends of the motor conductors will be sine waves. Current, according to

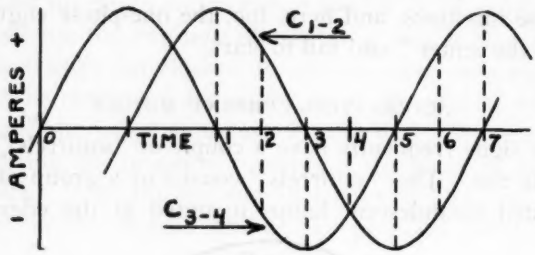

FIG. 7

Ohm's law, being voltage divided by a constant, the current in each phase will also be a sine wave of similar characteristics.

The current waves (Fig. 7), to a suitable scale, will therefore be similar to the voltage waves already shown in Fig. 4. When the current is a maximum in one direction in coil C_{1-2}, there is no current in coil C_{3-4}. This is shown in position 1, Fig. 7, at which

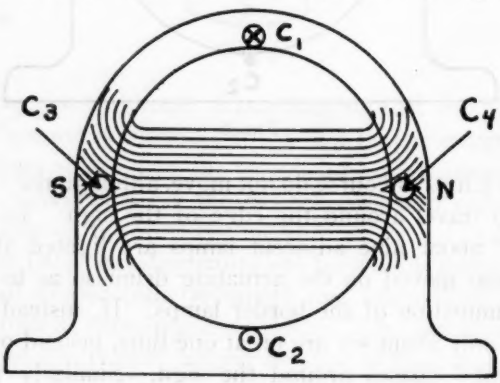

FIG. 8

point one current wave is zero and the other is at a positive maximum. The current running round and round the turns of C_{1-2} makes a magnet out of the stator, with temporary poles induced in the iron of the stator as shown in Fig. 8. One coil is seen to be working with maximum current, while the other, carry-

ing no current at this instant, has no effect. For illustration, the current is here assumed to flow down C_1 (normal to the plane of the paper) and up C_2. Current flowing down is shown as ⊗; current flowing up, as ⊙, and no current flowing, as ○. When the alternator of Fig. 2 has turned 45°, the current wave in the two motor windings will be as in position 2, Fig. 7. C_{1-2} is plus a certain value and C_{3-4} is minus an equal value. Therefore both coils now have current in them, and in such a direction that the resultant magnetism of the stator is as shown in Fig. 9, and the fields produced by the two coils adding together, as they do, the total flux is of the same strength as before. Another 45° rotation of the alternator, and the stator magnetism in the motor has

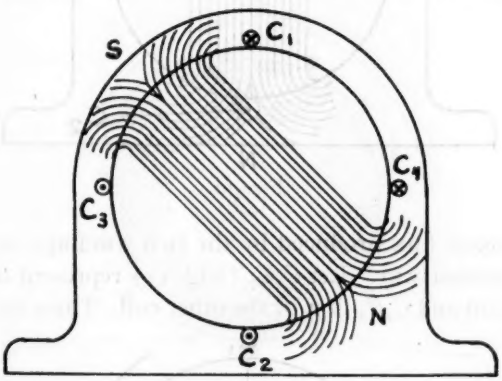

FIG. 9

moved around as shown in Fig. 10. Coil 1-2 now carries no current, and C_{3-4} is at a negative maximum.

For convenience we have been going by jumps of 45°. In the actual stator the induced poles actually revolve at uniform speed and the strength of the rotating stator field resulting from the two-phase currents is constant. Thus the cycle of events goes on indefinitely, and *the induced magnetic poles marked N and S rotate just as truly as though the whole frame of the stator were permanently magnetized like the field of a direct-current dynamo and revolved at uniform speed in a lathe.* The illuminated sign is now a stator, and the pair of " squirrels " are the induced magnetic poles chasing each other around. The pair of induced poles on the inside of the stator thus revolve once per one revolution of the alternator field, and this again brings out the fact that motor field and alter-

nator field (when of the same number of poles) *must* revolve at the same speed. Upon the rotation of the stator poles depends the whole action of synchronous and induction motors.

In the case of the quarter-phase currents of Fig. 7, the rotation

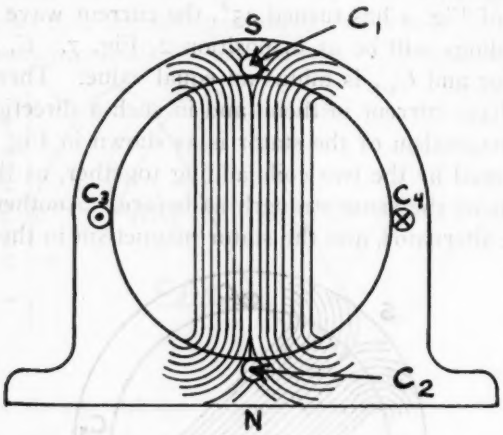

FIG. 10

of the resultant flux produced by the two windings can be easily shown in another way. Let C_1C_2 (Fig. 11) represent the plane of one stator coil and C_3C_4 that of the other coil. These two coils are,

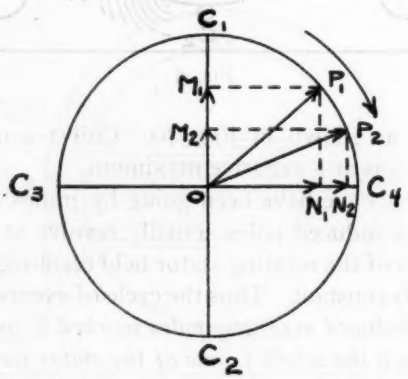

FIG. 11

of course, 90° apart. At any instant the flux due to the current in one coil may be represented by ON_1, and at the same instant the flux due to the other coil will equal OM_1 both in magnitude and in direction. The resultant flux is OP_1. At another instant the

component fluxes will be ON_2 and OM_2 respectively. The resultant of these two is OP_2, etc. OP_1 equals OP_2; hence the resultant stator flux is of a constant value and actually rotates at uniform speed. All the way through, for the sake of simplicity a two-pole stator winding has been considered. Actually the stator can be wound to produce practically as many poles as desired. Fig. 12 shows a stator wound for 14 poles. In such a stator one complete cycle of current, instead of making a complete revolution of the rotating flux, as in Figs. 8, 9, and 10, would revolve it uniformly only from N to the next N in Fig. 12. Assuming the alternator to have two poles, the flux in the 14-pole motor rotates only one-seventh of a revolution per revolution of the driving alternator.

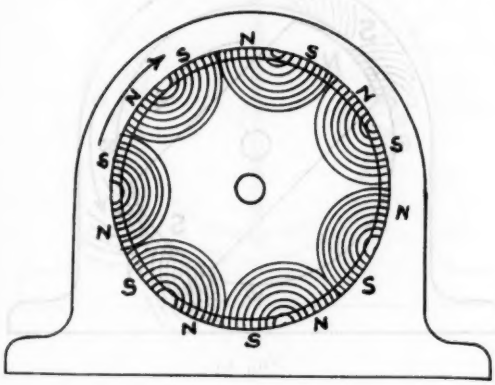

FIG. 12

A 7-to-1 reduction is thereby obtained. By throwing a switch the windings of the 14-pole motor can instantly be so connected as to produce, say, eight poles, and a 4-to-1 reduction results. Here, by throwing a switch, is our two-speed gear!

All motors, for either direct or alternating current, depend for operation on the magnetic attraction of unlike poles and the repulsion of like poles. Having demonstrated the fact that the stator of an alternating-current motor possesses a rotating magnetic field, we will now insert a rotor (Fig. 13) having one pair of poles just like the rotating field of the alternator. If this field is excited by direct current through slip rings, we shall have a two-pole synchronous motor, previously described. The *magnetically* rotating stator-field will be locked to a *mechanically* revolving

rotor-field. The lock is the magnetism across the air gap. We have all along assumed C_1 and C_2 of the alternator to be connected to C_1 and C_2 of the motor, and C_3 and C_4 of the alternator to C_3 and C_4 of the motor. With this arrangement the motor revolved in the same direction as the alternator. If now C_1 and C_2 remain as before and C_3 and C_4 of the alternator are connected to C_4 and C_3 of the motor, respectively, conditions will be identical, except that the rotating stator field (hence the rotor itself) will revolve in the opposite direction. This can be readily demonstrated, as was done in Figs. 8, 9 and 10.

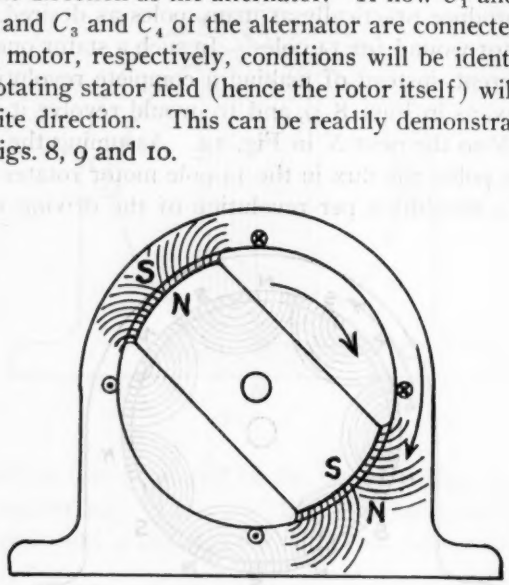

FIG. 13

Hence, *to reverse the direction of rotation of a quarter-phase motor, interchange the two connections to either one of the phases.* Here, by throwing a switch, is instant reversibility!

From what has been said, it is evident that a two-pole alternator at 1500 R. P. M. will drive a four-pole motor at 750 R. P. M. We have already called the alternator at 1500 R. P. M. a 25-cycle machine; therefore the speed of the motor in revolutions *per minute* is $\frac{25\times 60}{2}=750$; 25 is the frequency and 2 represents *pairs* of stator poles. The rule thus becomes: *The synchronous R. P. M. of an alternating-current motor equals the frequency multiplied by 60 divided by the number of pairs of stator poles.*

In general, therefore, the alternating-current motor can be made to fulfill the functions of the gear-box on the automobile, as also certain of the desired features of ship propulsion.

THE INDUCTION MOTOR

The foregoing general description of the alternating-current motor was introduced largely to demonstrate more easily the fact that there is produced in the stator an actual rotating magnetic field. Among other disadvantages, the synchronous type of motor will not start under load, and of course it requires direct-current field excitation. The *induction* motor *will* exert a torque at starting and requires (in the type finally adopted for battleship propulsion) no leads whatever to the rotor. Whatever differences exist, one important feature is the same in both types. *The stator*

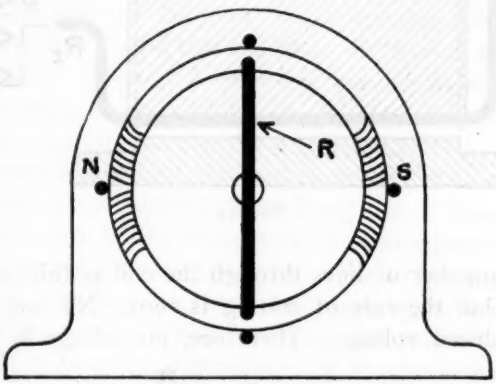

FIG. 14

of a synchronous motor and the stator of an induction motor are identical in every respect. Pole changing and reversing are therefore identical in the two types, and the *rotating* magnetic field is present in each. Referring to Fig. 14, consider the stator to be wound for quarter-phase current as before described, and that the rotating field has been established. Insert a solid iron rotor with one coil of wire on it, as R_1R_2 (Fig. 15). The coil may be of one or many turns, with the ends brought out. Fig. 15 shows an elementary axial section. Consider for a moment the rotor to be held stationary, also remembering that a current in a wire wrapped around iron produces magnetic poles on the iron whether the current be direct or alternating, and no matter how the current is produced. In the synchronous motor the current in the coil R_1R_2 would be direct current through slip rings. In the induction motor the rotor current is *induced*.

Start with the rotor stationary, and with coil R and rotating field NS in the relative positions shown in Fig. 14. The rotating two-pole field does not actually *cut* the stationary conductors of coil R in this position, as all of the stator flux threads through the

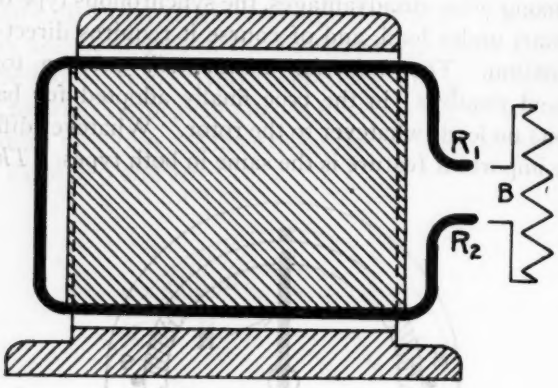

FIG. 15

coil. The number of lines through the coil in this position is a maximum, but the *rate* of cutting is zero. No *rate of cutting* flux, no induced voltage. Therefore, no voltage is induced in

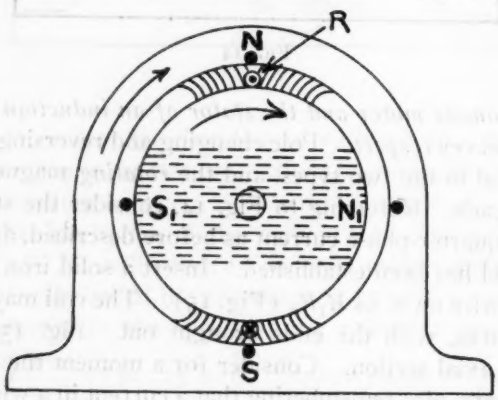

FIG. 16

the coil, and if the ends were short-circuited no current would flow around the rotor. Keeping the ends R_1 and R_2 (Fig. 15) short-circuited on each other, assume the rotating stator flux proceeding clockwise towards NS (Fig. 16). This moving flux is

now cutting coil R at an increasing rate; hence a sine wave of current is *induced* in the rotor coil just as in a transformer. A maximum rotor current occurs when NS is vertical, as shown in Fig. 16. This current magnetizes the rotor iron in the direction N_1S_1. S_1 is naturally attracted by N, and N_1 by S, and the rotor tends to revolve in a clockwise direction. Hence we have an action similar to a synchronous motor, only the poles on the rotor are not made by direct current from an outside source, but *by an induced alternating current in the rotor*. Furthermore, even when the rotor is stationary, as at starting, mechanical torque is produced. If followed out through a complete revolution of the stator flux, it will be found that the rotor will tend to turn (or be dragged around) through a complete revolution also, and if mechanically released will so turn, in a clockwise direction. As actually built, a symmetrical winding of many turns is put on the rotor to get even balancing and constant torque. The elementary theory is equally true, however, with many coils. Reversing the direction of rotation of the stator flux by interchanging the two leads to either phase will reverse the rotor just as in a synchronous motor, and by winding the stator for many poles low rotative speeds are also possible. The following difference in the two types of motor is, however, paramount: In the *synchronous motor* the rotor receives its magnetizing current through slip rings from an outside source, while in this motor the rotor current is produced directly by having its windings cut by the rotating stator flux. Hence the name *induction motor*.

Right here there comes a hitch. Suppose, after releasing the rotor, it should speed up until the coil R is rotating just as fast as the stator field? At this point, there being no *relative* motion between stator field and rotor winding, there will be no cutting of flux, no rotor voltage, no current induced in the rotor winding, hence no rotor magnetism. *There will, therefore, be no torque.*

The speed of the rotating stator flux in R. P. M. is called the *synchronous speed*, and is the exact and only speed at which a *synchronous* motor will run. But according to our theory of the *induction motor*, the rotor ceases to get its induced current and magnetism at synchronous speed and will fail to work. Such is the case. Therefore, what happens?

Instead of running at synchronous speed the *induction motor* slows down until its rotor windings *do* have a motion relative to

the rotating stator field, and to a point where this relative motion is sufficient to generate the required low-frequency current in the rotor windings. *The difference between synchronous speed and actual rotor speed is called the slip of the motor.* Slip in R. P. M. is usually divided by synchronous R. P. M. and expressed as a percentage.

As assumed all the way through this description, the *frequency* in the stator windings has been 25 cycles. When the rotor of Fig. 14 is stationary, the induced frequency in the rotor coil or coils is, of course, 25 cycles, too. If the rotor could get up to synchronous speed, the rotor frequency would be zero; therefore no current would flow. This case has just been dealt with. At a slip S per cent, what is the rotor frequency? It is obviously $\frac{S}{100} \times 25$ cycles per second. We have said *voltage is rate of cutting flux*. The *rate* at which the rotor conductors cut the rotating stator flux is zero at synchronous speed, is full frequency at no speed (rotor stationary), and between these two is proportional to the slip. As the rate of cutting varies as the slip, the induced rotor voltage also varies as the slip. But current $= \frac{\text{voltage}}{\text{resistance}}$. For given current a small induced voltage or slip implies low rotor resistance. *Therefore, the lower the rotor resistance the nearer the rotor can approach synchronous speed.* This low resistance is obtained, often, by making the rotor winding simply of copper bars and short-circulting the ends of these bars with heavy copper rings. It is not even necessary to insulate the copper bars from the iron core. See Fig. 17, which is a photograph of such a rotor. This is called a "*squirrel-cage*" rotor. The stator used with this rotor, as has been said, consists only of insulated copper wire imbedded in slots and, of course, does not move. This, then, is essentially the type of motor which may run under water without possibility of injury, as mentioned at one place under "*Why electric propulsion?*" The slip of a squirrel-cage motor at full load may be as high as 5 per cent. The slip decreases as the load is taken off, and at no load may be a fraction of 1 per cent.

The squirrel-cage induction motor is therefore essentially a constant-speed motor, and its characteristics are comparable to a direct-current shunt motor.

If the load on a squirrel-cage motor is increased, the slip increases, and at a certain point the magnetic bond between the rotor and stator becomes overstrained and the motor stops, or breaks down. There being no commutator to burn up, no damage is done, although the current in the windings may reach a very high value. This breakdown torque is at least double the rated full-load torque. From this it follows that in starting a squirrel-cage motor, at full voltage, under, say, full-load torque, a very

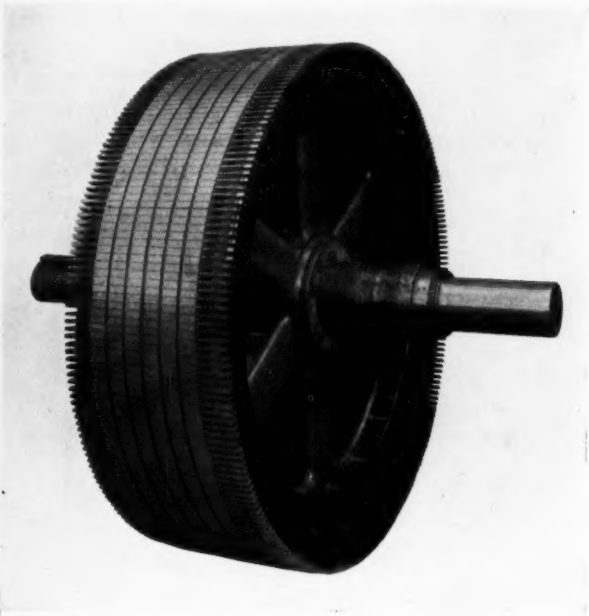

FIG. 17

heavy current will flow; perhaps six or seven times normal full-load current. This in many motors is prevented by introducing starting compensators. A compensator is a small transformer which reduces the stator voltage until the motor is up to speed. Holding down the voltage applied to the motor in starting has the desired effect in preventing the flow of excessive currents, but at the same time this limiting of the current at starting cuts down the starting torque considerably. It can be proved that the *maximum* torque which an induction motor can exert depends directly on the square of the applied voltage, and that the slip at which

this maximum torque occurs can be regulated at will by adjusting the rotor resistance. This is shown in Fig. 18. Curve *A* shows a squirrel-cage torque curve. Here *maximum* torque is at 10 per cent slip, and full-load torque at 3 per cent slip. Curve *B* is a higher-resistance rotor with maximum torque at 28 per cent slip. The line *MN* represents full-load torque. By making the rotor resistance sufficiently high, maximum torque can be given at 100 per cent slip or, in other words, at starting (curve *C*). Note that at constant voltage the *maximum value* of torque is the same in all cases, and only the *position* with respect to slip is changed by

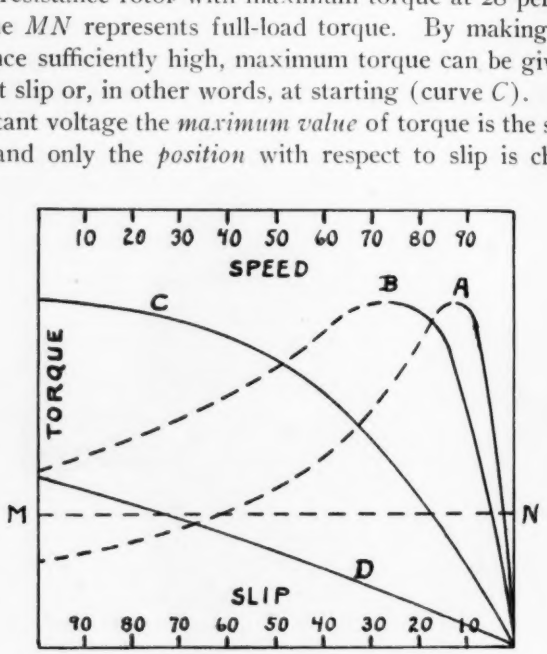

FIG. 18

varying the rotor resistance. Broadly speaking, then, in a squirrel-cage induction motor the speed at any given load can be varied *by varying the applied frequency*, and the *maximum torque* can be varied by varying the applied *voltage*. This type, with its poor starting features, is therefore not altogether suitable for ship propulsion.

THE PHASE-WOUND INDUCTION MOTOR

This brings us to a second type of motor called the *phase-wound induction* motor. The stator is the same as before. Here the rotor windings are not short-circuited at R_1 and R_2 (Fig. 15), but are brought out to slip rings. The motor then becomes a *phase-wound* motor.

If these slip rings are short-circuited, we have the equivalent of a low-resistance or squirrel-cage winding just described, and in this rig the motor is suitable for constant-speed work. If, instead of short-circuiting slip rings R_1 and R_2, we insert resistance between them (B, Fig. 15), we thereby demand more rotor voltage to force the current through the coil. We therefore have a temporary high-resistance rotor. This means we can get the same torque that we can in a squirrel-cage motor, but the *slip* will be greater to get it. By suitably proportioning this resistance, any starting torque (up to the maximum possible) can be obtained with *only normal full-load current*, and by using a controller the

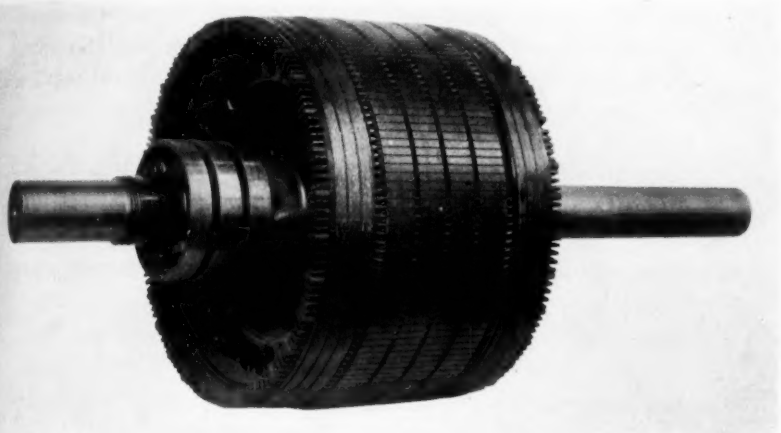

FIG. 19

resistance can be varied at will. Curves of torque plotted on slip for the squirrel-cage and phase-wound types of motor are shown in Fig. 18. Curve A represents a squirrel-cage motor of low resistance and shows maximum torque at 10 per cent slip. Curves B and C show a phase-wound rotor with resistance enough added across the slip rings to give maximum torque at 28 per cent and 100 per cent slip at will. This, then, makes a good variable-speed motor, as does the direct-current series motor with rheostatic control. Furthermore, the heat losses in the resistance B (Fig. 15) are strictly comparable to the heat losses in the starting rheostats of, say, a direct-current series street-car motor. Fig. 19 shows a three-phase-wound rotor.

A phase-wound induction motor, with slip rings which can be either short-circuited at the higher running speeds or connected through a resistance for starting or maneuvering, demands no excessive starting currents and must, then, be a good solution for ship propulsion. Motors of this type are in satisfactory use on the *Jupiter*.

It was only after years of work and research that resistances could be built for handling the tremendous rotor currents in a ship motor. This was solved on the *Jupiter* by putting the special alloy resistances in tubes of sea water. The water is circulated through the tubes when necessary by a connection to the main circulating pump.

While a phase-wound motor with variable rotor resistance makes a possible solution for either battleship or collier, the elimination of the resistance and slip rings would in general make a much better solution, provided the desired torque slip characteristics could be obtained.

Electrical engineers think that the solution is obtained in the double squirrel-cage induction motor, and there is every reason to believe they are right. Motors of this type have been built in the smaller sizes and thoroughly tested, although for general power purposes ashore they are little used.[1]

THE DOUBLE SQUIRREL-CAGE INDUCTION MOTOR

It has been pointed out that the squirrel-cage induction motor, with its low-resistance rotor windings, makes an ideal, highly efficient constant-speed motor, but, due to these same low-resist-

[1] From an electrical point of view the induction motor is most readily understood by comparison to a transformer. Practically all calculations on induction motors are made on this assumption.

The stator is the transformer primary, the rotor the secondary. Both machines inherently take a lagging current, hence form an inductive load on a line. The output of the transformer secondary is electrical energy; the output of the induction motor appears partly as heat energy in the rotor conductors and resistances and partly as mechanical power.

The mechanical power of the rotor is obtained as a result of magnetic stress between rotor and stator. This same magnetic stress exists in transformers and in the early days of transformer construction wrecked many a suddenly overloaded machine. Steinmetz evolved the "equivalent" transformer circuit as the readiest means of calculating transformer results. This same device applies equally well to the induction motor and is readily understood.

ance windings, gives low starting torque, when only normal current is consumed, and, if full-load starting torque is demanded with a starting compensator, about 250 per cent full-load current is obtained. If full voltage is applied to a loaded squirrel-cage motor, approximately 700 per cent full-load current is required for starting.

The phase-wound motor, by temporarily increasing the rotor resistance, outside of the machine, gets around the starting difficulties of the squirrel-cage type. It does this, however, at the sacrifice of efficiency and with the mechanical difficulties incident to slip rings and cumbersome resistances. In large motors the resistances become very sizable, and, indeed, their construction was for years the main hindrance to the adoption of phase-wound motors for ship propulsion.

Designers, scanning the numberless schemes that have been evolved to perfect the starting of induction motors, finally eliminated all but the Boucherot method. M. Boucherot succeeded in building a squirrel-cage induction motor with a rotor so designed electrically that at low speeds (high slip) it offered high "resistance" to the rotor currents, while at high speeds the effect of the windings was to give a low "resistance."[2] This means a rugged construction, with the advantages of a squirrel-cage and also the starting characteristics of the phase-wound type. All this is obtained with no additional mechanical difficulties, with negligible loss in efficiency, and *without any* exterior resistances or connections. Furthermore, the two characteristics, that of low "resistance" at high speed and high "resistance" at low speed, are adjusted automatically as required by the machine itself. All this is obtained by what is known as the *double squirrel-cage* construction.[3] Just above, it was stated that the rotor of M. Boucherot's motor had a high "resistance" under certain conditions, and, under other conditions of slip, a low "resistance." In so saying, certain liberties were taken with the good word "resistance," and it is here necessary to more accurately describe what actually happens. A short digression into theory is involved.

[2] See "Electric Motors," by Henry M. Hobart.

[3] The full-load power factor of a double squirrel-cage motor may be 10 per cent lower than in an equal-size single squirrel-cage machine.

Ohm's law and Kirchoff's law give all that is needed for direct-current work, and the former is often expressed simply as $E=RI$, where E = electro-motive force or voltage, I = current in amperes, and R = resistance in ohms.

A current, direct or alternating, in a wire always creates a closed magnetic field or flux around that wire (Fig. 22). When the current is direct, once the current is established, the field stays around the wire and its presence is forgotten (unless, perhaps, there is a compass near). Every time an alternating current pulsates, however, the field around the wire is set up in one direction, brought back to zero, then set up in the other direction. In the present case this happens 25 times a second. This magnetic field, waxing and waning, and every time cutting the wire, induces an electro-motive force in the wire just as the rotating field of the stator induces a voltage in the rotor conductors. No longer does Ohm's law (as usually stated) apply. The new condition is expressed by an equation $\epsilon=Ri+K\frac{d\phi}{dt}$.

Here again ϵ = the electro-motive force in volts and i = the current in amperes. Small letters are used to denote *instantaneous* values. According to the calculus $\frac{d\phi}{dt}$ = *rate* of cutting lines, where ϕ represents the number of encircling magnetic lines (the flux) and t represents time. Rate of cutting flux represents an electro-motive force in the wire, and the constant K is introduced to reduce this to volts. Therefore the law becomes $\epsilon=Ri+K\frac{d\phi}{dt}$, where the term $K\frac{d\phi}{dt}$ must be added to the Ri voltage of Ohm's law on account of the varying magnetic field always present with an alternating current.

As the flux in the air around the wire is caused by the current in the wire, it is found that the size of the flux ϕ varies directly with the current i, and, if we wish, i may be put in our equation in place of ϕ; i can be easily measured, while ϕ cannot. The only change will be in the constant, which must be of a different size to still express volts. $K\frac{d\phi}{dt}$ therefore becomes $L\frac{di}{dt}$, and the equation may be written $\epsilon=Ri+L\frac{di}{dt}$. It is now in convenient

form, and R and L being constants, we have ϵ expressed simply as a function of i.

Look at Fig. 20, where the solid line represents the varying values of i, any point on the curve being reached 25 times a second. How can we draw a curve expressing $L\frac{di}{dt}$? From the calculus it is evident that when i is a plus or minus maximum $\frac{di}{dt}$ is zero; also the rate $\frac{di}{dt}$ is a maximum when the curve of i is steepest. Examination of the current curve shows that $L\frac{di}{dt}$ must therefore look like ϵ_1 (Fig. 20).

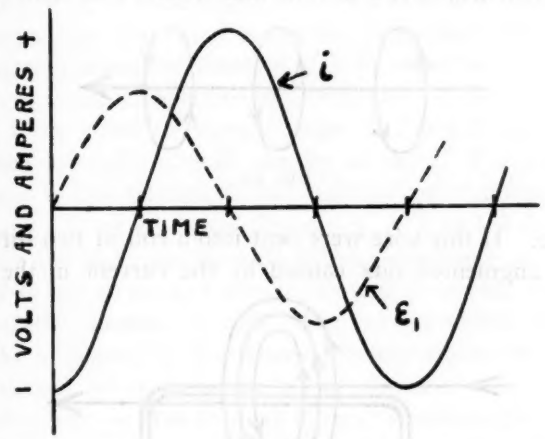

FIG. 20

ϵ_1 is a sine wave of the same period as i and occurs 90° ahead of i; i is still amperes and by hypothesis we have used L of such a value as to make ϵ_1 volts. We can now say $\epsilon = Ri + \epsilon_1$. Unfortunately, ϵ_1 cannot be added algebraically to Ri because we have just said ϵ_1 is 90° *ahead of* i, while Ri is in phase with i. They can be added, however, just as forces are added in mechanics. This is called *vector addition* and is necessary where quantities have *direction* as well as *magnitude*. The dots under the letters in the last equation represent vector addition. The vector addition is correctly shown in Fig. 21.

In the preceding paragraph we shifted from $K \frac{d\phi}{dt}$ to $L \frac{di}{dt}$, saying i (amperes) was easier to measure than ϕ (flux). L we

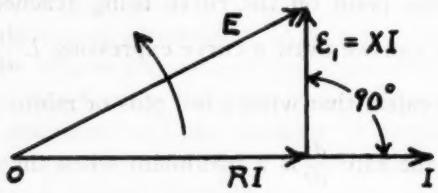

FIG. 21

called an arbitrary constant. A straight wire in air carrying a given current will have a definite flux around it as shown roughly

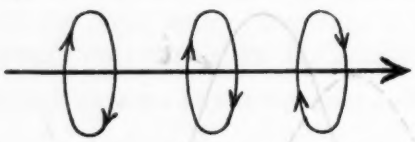

FIG. 22

in Fig. 22. If this wire were bent into a coil of two turns (Fig. 23), the augmented flux caused by the current in the parallel

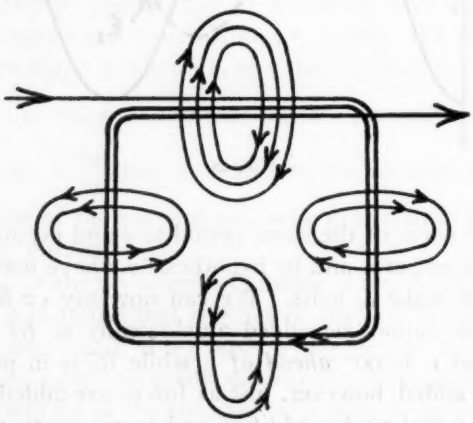

FIG. 23

turns would encircle or link more turns of wire; hence the induced voltage would be much greater. A bigger value of L is therefore required for a coiled wire carrying current than for the same

length of straight wire with an equal current. L is therefore dependent upon the shape of the circuit, and is called the *coefficient of self-induction* or often the *inductance* of the circuit. A piece of iron in the coil will increase L, etc., and in general L is difficult to determine. Once given a coil permanently wound, L can be found, if desired, and is really some sort of a constant *depending on the shape and surroundings* (iron or no iron) of the coil.

Doubling the frequency of i doubles the rate $\frac{di}{dt}$, hence doubles $L\frac{di}{dt}$ or ϵ_1. To provide for this possibility we measure L at one cycle per second and use fL, where f = frequency in cycles per second.

Ri, according to Ohm's law, is an electro-motive force in phase with the current and equal to current (amperes) multiplied by a constant, and when the constant R is in *ohms* the electro-motive force is in *volts*, irrespective of frequency. ϵ_1 is also an electro-motive force equal to current times fL, and if the current is multiplied by $2\pi fL$, ϵ_1 will also be in volts. For convenience, then, $2\pi fL$ will be written X, and is a constant expressed in ohms.

For any coil, at any given frequency, X is called the *inductive reactance* and is a *constant with which to multiply the current in the coil to get a voltage across the coil occurring 90° in time ahead of the current.* $\epsilon_1 = XI$. Fig. 21 represents such a voltage. As indicated by the arrow, counter-clockwise rotation is assumed, and XI is shown to be 90° ahead of RI. While ϵ, ϵ_1, and i have been written in small letters to indicate the instantaneous values of the alternating voltage and current at any moment, the equation is equally true for the effective values which are read on all voltmeters and ammeters. The equation will hereafter be written $\dot{E} = \dot{R}I + \dot{X}I$. From the figure it is evident that $E^2 = (RI)^2 + (XI)^2$, or $E = I\sqrt{R^2 + X^2}$. If for $\sqrt{R^2 + X^2}$ we use Z, we have $E = ZI$. *Z is a constant expressed in ohms by which to multiply an alternating current (amperes) in a circuit to get the total voltage across the circuit, and is called impedance.* In a circuit where the frequency varies (as in the rotor of an induction motor starting up), the resistance (R) is a constant and the impedance (Z) varies as the reactance (X). We thus have the equivalent of a rotor of variable "resistance" previously mentioned. Z now takes the place of R in Ohm's law for direct cur-

rents, and we will hereafter use it where applicable. The apology to the word " resistance " is complete, and we accordingly say that the Boucherot rotor is so designed that at low speeds (high slip) the *impedance* to the rotor currents is high and at high speeds it is low. It follows that low rotor speed = high slip = high rotor frequency = high rotor reactance ($2\pi fL$) = high rotor impedance. The converse is likewise true.

Therefore at low speed we have a high impedance rotor like a phase-wound motor in starting rig, and at high speed the impedance is low and we approach the squirrel-cage characteristics. The ideal characteristics for ship propulsion are thus obtained,

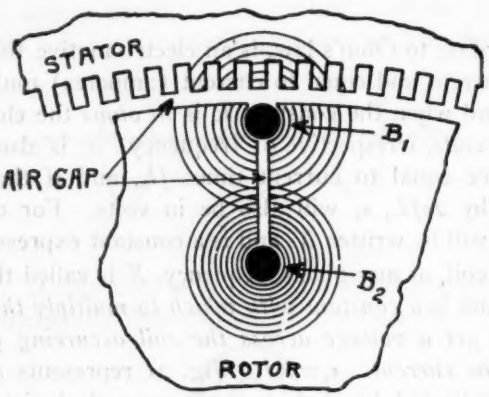

FIG. 24

and all the while with no rotor rheostats nor even slip rings—simply a rugged iron and copper squirrel cage.

How, then, are these conditions realized? Fig. 24 represents a section through the rotor showing an outer and inner bar of the double squirrel-cage winding. Thinking of these copper bars simply as two parallel wires, we would like to have the pair of them (acting always together in parallel) at low speeds offer high impedance and at high speeds low impedance.

Notice the annular air gap between stator and rotor, also the axial air gap between inner and outer bars. In designing, these air gaps can be made any size at will.

In developing the idea of *reactance* it was stated that XI was the voltage produced in a wire by the alternating magnetic flux around it. The magnitude of the reactance, therefore, depends

upon the amount of this flux. *It takes 2000 to 3000 times as much force to drive a magnetic flux through an air gap as through the same thickness of steel.* Therefore, by introducing an air gap near a wire imbedded in iron we can reduce the encircling flux, hence the reactance of the wire. Refer now to Fig. 24 and note the *two* air gaps and stator slots near B_1, which the flux around that bar must cross when a current flows in the bar. At the same time B_2 has only one narrow gap to hinder its flux. The *reactance* of B_2, therefore, can be made as much larger than the *reactance* of B_1 as the designer wishes, and by burying B_2 deep in the rotor iron its reactance may become very high.

We have, therefore, a bar of high reactance, B_2, and a bar of low reactance, B_1. *Reactance* being a function of *frequency*, it follows that at starting (high rotor frequency) the bar B_2 will have high reactance; hence the parallel circuit of B_1 and B_2 will have high impedance (the ohmic resistance of both being assumed not to vary), and we have produced the high-"resistance" rotor originally mentioned as so desirable in starting. With the very small slip at running speeds the *reactance* of B_2, hence the impedance of the two bars, is low and the squirrel-cage characteristics appear.

So far as the reactance of B_2 is concerned, the radial air gap could be omitted, but if there were no air gap between B_1 and B_2 the main flux through the rotor would go between B_1 and B_2, and thus much of its use on B_2 would be lost. Figs. 25 and 26 show the real reason why the radial gap extending between B_1 and B_2 is used. The fact that its presence decreases the reactance of B_2 is incidental and actually makes little difference. In other words, with the gap (Fig. 26) it is easier for the rotating main flux from N to S to go around B_2 (as is desired) than to short-circuit or "leak" between the bars (Fig. 25).

* * *

Summing up the machines, we may say that a quarter-phase alternator delivers separate alternating sine waves of current to two windings 90° apart. The four stationary terminals of the alternator are connected to four similar terminals of a motor stator. Whether the stator be that of a synchronous motor or that of an induction motor of any type makes no difference, as the stators are identical in any case. The stator may be wound for any even number of poles within reason, more poles meaning simply a larger

speed reduction with respect to the driving alternator. With a given number of poles, speed changes can be made only by *varying the frequency.*

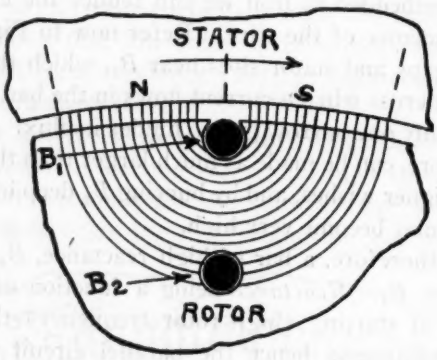

FIG. 25

The synchronous motor, once speeded up by outside means, and its field excited by direct current through two slip rings, will deliver power *at synchronous speed.*

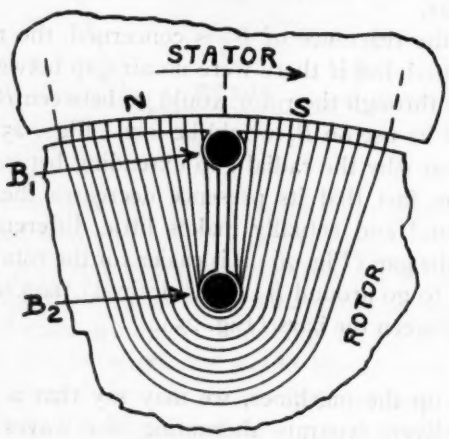

FIG. 26

The squirrel-cage induction motor having a low-resistance, indestructible rotor, operates slightly below synchronous speed by an amount called its " slip." This type of motor takes excessive starting currents and is suitable only for constant-speed work.

The phase-wound induction motor has slightly poorer full-speed characteristics than the squirrel-cage type; it is more difficult to build, but serves very well, when connected through slip rings to external resistances, for variable-speed work. In large sizes the rotor resistances become excessively large and waste much energy as heat.

The double squirrel-cage induction motor combines many of the good qualities of the two preceding types, and for ship propulsion is by far the best solution. In this type the rotor is of variable *impedance,* depending upon the slip, so that at starting when slip is 100 per cent it offers high impedance to rotor currents, and when up to speed (say, 5 per cent slip) its rotor conductors offer an easy path to the then low frequency currents. The power factor of the double squirrel-cage motor is low, but for ship work with no other loads on the alternaors than the main motors this fact matters little.

CONCLUSION

There are, of course, as many advocates of the different means of battleship propulsion as there are types. As in correspondence-filing systems, there are good points in all and bad points in all, and no one is perfect. There is usually one best method for any particular case, and trying to get all the good points and none of the bad is hopeless. So with the power for propelling battleships. Many means have been tried, many more proposed, several of these, too, involving electricity in one form or another. Taken broadly, however, from a point of view of reliability, economy, minimum weight and space, ease of upkeep, and general ruggedness, it is believed the *California* will be in all respects a pacemaker among the battleships of the world.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LETTERS OF A RETIRED REAR ADMIRAL TO HIS SON AT THE NAVAL ACADEMY

By CAPTAIN A. P. NIBLACK, U. S. Navy

LETTER NO. 7—DOES IT PAY TO BE A NAVAL OFFICER?*

MAY 30, 1913.

Dear Son.—You ask me if I think it pays to be a naval officer. It depends. It depends on whether or not you are prepared to play the game. "Obedience to the law is liberty." If you keep the law, it pays. If you have the courage of your convictions, it may not pay. If you play the game; if you always keep a month's pay on the books; if you put nothing else ahead of your profession; if you pocket your opinions, it pays. Otherwise it may not. Let us see.

The naval profession is much like the ministry. You dedicate your life to a purpose. You wear the garb of an organized profession. Your life is governed by rules laid down by the organization. You renounce the pursuit of wealth. In a large measure you surrender your citizenship; renounce politics; and work for the highest good of the organization. In the final analysis your aims and objects are quite as moral as any minister's, because morality consists in the conservation of the best interests of civilization, and you are not seeking your own good, but the ultimate good of your country. You train the men under you to be good and useful citizens, and, like the minister, what you say must conform to the rules of the organization.

The exactions of the naval career are endless. On entering the navy, and every year thereafter, as well as every time you are promoted, you have to submit to a physical examination, by a board of three medical officers of the navy, as strict as, and

*Letter No. 6 omitted by direction.

similar to, that given you for life insurance. On each promotion you have to pass a long and tedious written examination, covering a multitude of professional subjects, which is always a searching and trying ordeal, and always looming up as you approach the next higher grade. Every six months your immediate superior reports in writing on you as to your fitness as an officer in every particular—professionally, morally, physically, and temperamentally. On these reports hang somewhat your fate, when you are up for promotion, and, once every year, the board of five rear admirals scans your reports of fitness, and selects the officers who are to be forcibly retired, as least desirable, each July 1st. Once a month you have to walk ten miles in three hours or so to demonstrate that you remain physically fit. On your opinions as a citizen or as a naval officer you must exercise a rigid censorship. You must, like the good little child, be seen and not heard. Chaplains are provided for your spiritual comfort, and your personal habits are subject to official regulation.

In fact, you are the only office-holder under the government that has to pass an examination as to your mental, moral and physical fitness for every grade, and then you may get plucked after you have done so. Except in the classified Civil Service, and in the army, navy, marine corps, and kindred organized branches of the government, no examination other than one at entrance is required. Everything is expected and exacted of you. In command of a ship, in time of political disorders in countries in which the banana grows, if you make no mistakes you hear nothing. If you guess wrong, you hear much. Virtue is its own reward, and you learn to rely on yourself. The system is, however, not calculated to make a John Paul Jones out of you, and it is good policy to do nothing, when in doubt.

I may ask, does it pay to be a lawyer? In the legal profession one lawyer wins a case that the other side must lose, but some lawyers get rich, and become famous as successful losers. They are employed to defend forlorn hopes. Any lawyer, however, who will examine legal procedure in our navy, will be gratified beyond measure at the enlightened, up-to-date spirit of justice and fair play which characterizes it. In penology, in suspended sentences, in reformatory punishments, in confinement in disciplinary barracks, the country at large has much to learn from our navy.

Does it pay to be a doctor? Yes, in the navy, for in modern sanitation, in up-to-date prophylaxis, in surgery, and in the practice of the profession, there is a supervision which does not obtain in civil life. The various states are supposed to regulate the practice of various branches of medicine, but the general indifference to public welfare is appalling. A doctor's mistakes are discreetly buried, but if in our business you make a mistake of a few feet and collide or ground with a vessel of the navy, it is in every newspaper, the civilized world knows of it, and you get a court of inquiry, and probably a court-martial. You, at least, are permitted no lapses.

Does it pay to be a diplomat? In Great Britain no one can belong to the diplomatic service who has not an outside income of £400. In ours much more than that is needed, although not required. The examinations for entering are severe, and you must give up any idea of rising higher than first secretary. If you accept a promotion as minister, off goes your head in the basket later on. Meanwhile you may spend your own money to keep up appearances, and you may break in new ministers or ambassadors, who from time to time are handed the posts which you have spent years fitting yourself to occupy. You must remain satisfied with your disinterested patriotism, and must ever keep aloof from the secret diplomacy which leads in the end to war.

In the navy, after you have been in it a certain number of years, every one knows you, has you labelled, sized up and catalogued. If you have gotten into trouble, it is lovingly remembered and fixed to your name. The board of five rear admirals each year carefully inventories all your shortcomings, and weighs them in the balance, and, on the first day of each July, four or five captains out of 70 have to walk the plank; out of 112 commanders, three or four find themselves lacking; and out of 200 lieutenant commanders, three or four are relegated to the outer. Also two lieutenants are thus scrapped. There is nothing else like it under the government, except the November elections, when the people reach out and "pluck" their representatives who have been listening with ear to the ground to do their slightest bidding, and yet failed to interpret the signs.

However, line officers of the navy are the only class of people who have to actually and continuously demonstrate their fitness to hold their jobs, and the only ones who have to take a chance

on being "smirched," after making good on all the requirements. Meanwhile, from year to year, the great uplift movement goes on, always new schemes to improve the efficiency of line officers, physically, mentally and morally. Examinations become more rigid. New tests are exacted. Inspections are made to test the efficiency of commanding officers, and every year the plucking knife sinks deeper and deeper.

Meanwhile nobody else under the government has necessarily to know much of anything, except to be geographically and politically well located. There is no examination for ambassador, collector of internal revenue, postmaster general, marshal, district attorney, interstate commerce commissioner, etc. It is merely a question of getting the appointment, and being confirmed by the Senate.

It is therefore some achievement, after all, to survive the slings and arrows of outrageous fortune, and retire for age on attaining the age of 62 as a rear admiral, U. S. Navy. What we all need, however, is a little less regulating. Old Bill Schwenk used to tell of a poor man whose wife was ill in a charity hospital. Every day he called, and was not allowed to see her, but was told she was improving. One morning he was told she was dead. When a friend asked him what she died of, he answered, "Improvement."

So cheer up, my son. Play the game. Take your medicine. Don't squeal. Watch your step. After all, it is a splendid profession, and an honorable career. In your 45 years of active service you will see, as I have, the great and near-great fret their brief time upon the stage and pass out. You remain, and some way or another the navy seems to survive the assaults upon it, as it is, after all, bigger than any one man.

Personally, I would rather be a commissioned officer in the navy than hold any other position under the government. It is an honor; it is a career; it is one of the most exacting and difficult of all professions. Otherwise I would not have urged you to enter the navy.

Affectionately,

DAD.

LETTER NO. 8—THE UNITED STATES AS A NATION

JUNE 1, 1913.

Dear Son.—Starting as a fringe of settlements on the Atlantic coast, by communities which were looking for religious liberty and willing to concede none to others, the conviction soon spread that

to succeed as a colony required colonists, and to bar people for their religious beliefs was fatal. Progress began when this idea took root, and, when we became a nation, religious liberty became one of the fundamental principles of our government. As the pressure of population, or the desire to better one's lot, became strong enough, the more adventurous spirits struck out into the wilderness. Each settler, with all his belongings, took his gun and his life in his hands, and cleared the forest, and tilled the soil. They bred a race of fearless, hardy, capable, self-reliant people with initiative and adaptability, and of such independent spirit that local self-government, fair play, and the maintenance of order were the principles out of which a crude form of democratic government grew.

True democracy is of necessity based on self-government, but local self-government has its crudities, and states' rights, in a large measure, hinder the free exercise of the powers of the central government in its foreign, or exterior, relations. Outrages on foreign subjects resident in a state have had to be paid for by the national government, and states pass laws in conflict with international treaties. While we are inclined to boast of our wonderful form of government, we should clearly recognize its shortcomings. As grand as may be the conception of local self-government, it makes us always take the local point of view. A distinguished diplomat from a South American republic said recently: "We, in democratic America, have repudiated the Old World theory that above the individual citizen exists an entity called the state, before which private rights disappear, and whose mission is to grow and expand regardless of any respect for justice or law. . . . Nothing is, however, really greater than the freedom and welfare of the community." In these two sentences are represented the philosophy and the weakness of our form of government.

There is no good higher than the good of all. Anything which injures Seattle or New Orleans injures all. We are a nation. The community is nothing. The nation is everything. No one fights now as a member of a religious sect. Religious wars have gone forever. What is a city, or county, or state, compared to what we owe the nation, one and indivisible now and forever? But, after all, any educated and fearless people gets the government it wants and deserves. The people have, in the end, ways of

imposing their will on the apparent rulers as effectively as by the ballot box, or the barricade, and that is by the weight of public opinion. That there is necessarily any advantage or anything sacred in the republican form of government is an assumption not borne out by the career of most republics to-day. This very fact should render us more jealous and earnest to make our own government a success. Sir Walter Raleigh said: "There can be no greater liberty than a good government." That was some years ago.

The governing class in Germany is aristocratic. In England the land owners and professional men are in the saddle. With us the governing class is politicians. The balance of power in public opinion, however, still rests with the old American stock and their descendants, however much local government may, here and there, fall into the hands of foreign-born professional politicians.

The Constitution of the United States, that great and enduring monument to those who framed it, has embodied in it the principles learned in colonization, in revolt against oppression, in compromise with slavery, in civil strife, and in dire political necessity. Our government is about to undergo the supreme test as to whether or not it can hold its place as a world power by the sheer force of moral principle, unaided by alliances with other powers, or by any form of general military preparedness.

We have now to learn the great lesson of spending less on ourselves and more for the community. National defense and sound international relations must become cardinal principles of governmental policies, and patriotism must become more than an after-dinner sentiment to be applauded on a full gullet.

Burke says you cannot indict a people, and as the people rule in this country, it would look as if I lost my case by merely stating it.

I find these United States very poorly equipped for its manifest destiny as a world power in the following particulars:

1st: Although our flag is one of the oldest designs of bunting which the nations of to-day display as their national emblems, we are the only one which has no organized diplomatic service. Can we afford not to have a more or less permanent body of trained citizens to steer us clear of international complications? Our life of splendid isolation and self-centered local development has

made us a nation more or less careless of other people's viewpoint and susceptibilities. Nor are we distinguished for a wide understanding in international relations, nor for any too good manners. We are too much given to " Yes " or "No." A wag recently said: "If a diplomat says ' Yes,' he means ' Perhaps ' ; if he says ' Perhaps ' he means ' No ' ; but if he says ' No,' he is no diplomat." The Hon. James Bryce, not so well known now as Lord Bryce, says that he is glad the United States is not given to the secret diplomacy which by its intrigues so threatens the peace of Europe. Clearly, under our system, we are at least guiltless of being deep, but, with no limit on the game, our cards should at least be played by an expert, and not by an amiable amateur, selected for other than distinctly diplomatic qualifications.

2d: We have no national air.

The "Star Spangled Banner " has been taken up by the War and Navy Departments as " official," but no one takes it seriously in civil life. The words need editing, the air is unsingable, the sentiment is " high faluting," the third verse contains offensive words, and it does not make for international conciliation. At home and abroad, at gatherings of Americans, on national or festive occasions, nine times out of ten, the presiding officer proposes that: " We will all unite in singing the national anthem, ' My Country, 'tis of Thee,' " because every one knows the words, it is modest in sentiment, and it does not require years of musical training to sing it. This air, " America," happens also, incidentally, to be the national air of Great Britain, Germany and Denmark, so that our adoption of it, by Congress, as our national air would be a long step in international conciliation, because each one can sing his own words to the same tune, and all take off their hats and stand when it is played. It would thus make us somewhat more international and truly diplomatic.

3d: We are the only people in all the world who have no distinctive name as a people.

We call ourselves Americans, but all people who live on the continent of the Western Hemisphere are American, either North, South, or Central, but each has a distinctive name besides, such as Chilean, Brazilian, Mexican, Costa Rican, Canadian, etc., but we do not call ourselves United Statesians. The Argentines and Chileans claim that they have as much right to " American " as we have, and they call us " North Americans," or even " Yankees "

when not meaning to be flattering. As a matter of fact, the real Americans were Indians, so honors are easy, but the fact remains that we differ from all people in having no specific name. We were apparently not baptized.

"If you mean by South American," said a gentleman from the Argentine Republic the other day, "that I live on the continent of South America, you are correct, but if you mean that I am one of a people called South Americans you are wrong. There are no such people. I am a citizen of the Argentine Republic as you are a citizen of the United States, in exactly the same sense. I am a South American only as you are a North American." This appeared recently in the *Review of Reviews*. The Argentines always call us North Americans in all their newspapers, so the explanation does not explain, because Canadians and Mexicans are as much North Americans as we are, and have as much right to that title.

We cannot even claim the name of "United States" for our country, as there are the United States of Brazil, of Colombia, of Venezuela, and of Mexico, and our use of the term "American Legation" is also questioned, so we evidently are in need of a real name of our own.

4th: We share with Great Britain the distinction of being the only country which has not adopted the metric system of weights and measures.

Three barleycorns still make an inch, and when we speak of seeking our share of the world's trade we ought to at least use the same units. The Mother Goose melodies and the tables of weights and measures are dear to our childhood, but we ought to set a date when we mean to come of age, and join the family of nations.

5th: We have no Council of National Defense.

Apparently we do not see the need for one. It is because the coordination and cooperation of all the elements that enter into national defense is entirely lost sight of in our scheme of national government. Various committees and sub-committees of Congress are charged with the preparation and presentation of appropriation bills which have to do with keeping the various elements of national defense alive and wiggling, but as to their relation to each other, or their interdependence, that is entirely ignored. For fear of seeming to exaggerate, I will say, if I dared, that no one seems to care. You cannot even scare up an argument.

Meanwhile, we are the only country in the world in which the coast defense is under the army instead of the navy. We are the only country in the world in which the mine fields and mine-laying are under the army instead of the navy. We are the only country which has no military or naval reserve, and no provision for immediately expanding the entirely inadequate naval and military force we now have, except by calling out the militia of the various states. There is no General Staff in the navy, nor can we get one. The General Board of the navy is without any shadow of authority in its relation to the Naval War College, the Office of Naval Intelligence, and the aides, divisions and bureaus of the Navy Department.

In the coordination of all government activities and expenditures towards the attainment of military and naval efficiency in national defense, there is nothing now but the casual friendly cooperation of unrelated and independent departments of the government. The building of an inland waterway, or canal, from Boston to Florida and the Gulf of Mexico is demanded by every consideration of naval, military and commercial policy, but there is nobody short of a council of national defense which could adequately take up, study, and present the question as an issue outside of party politics, local interests, and national misconception. There are many similar questions which would keep a council busy for some years to come, and that is the objection to it. It means money, and that is the rub. Our chief assets, defensively, at present, aside from splendid but undermanned sea coast fortifications and an efficient navy of inadequate size, are our enormous wealth, our large and rapidly increasing population, two large oceans between us and trouble, and faith in prayer. Whether a council of national defense would rate these assets very high is a question.

6th: Now I hesitate. Of very little real importance, perhaps, yet we share with Great Britain an intiquated and unreasonable social protocol, or custom of exchanging social calls.

It is curious how important small matters may, on occasions, become, as for instance, who should leave his visiting card on whom. On the continent of Europe, and in the diplomatic corps the world over, in general terms, the last comer makes the first call. This is also agreed to in all navies, and followed in all armies. While Great Britain and the United States officially

subscribe to this, in everyday life and among women folks the opposite custom obtains, and every one is expected to call on the newcomer. In the navy officially among officers a commanding officer of a ship, division or squadron makes the first call on his superior in command of a ship, division, squadron or naval station. Among those not in command and among the wives there is no real rule respected, and it leads to uncertainties, misunderstandings and heart burnings. In all cases the first call should be made and returned in person, and the expectation is that it will be. In the diplomatic corps it is, in fact, often bluffed through, and careless diplomats have been known to rely on the office boy or the stationer from whom visiting cards are ordered, to make the first round of card-leaving visits. In all navies, calls are made in person and returned in person within 24 hours.

Aside from any mere formality or formalism, the exchange of visits and of visiting cards implies a "recognition" which forms the entire basis of social or official relations, and any one who belittles it is a nonentity, except in the narrow local orbit of his greatness.

It is high time we were taking steps towards our place in the world, and passing out many of the local issues in favor of national ones. Too much depends on geographical location in this country, even the presidency. Many people think the tariff, as well as prohibition and woman suffrage, are local issues. Certainly in the past the location of navy yards, naval stations, army posts, and harbor works have been more of a local than a national issue. Try to close a useless navy yard, and the noise is only greater when you try to close two. There is no question involved as to any benefit arising to the navy. The question, like most others, is frankly debated on the benefit to the community.

I once asked a handsomely uniformed colonel in the capital of a Central American republic (who also incidentally happened to be a son of the President) how he liked the United States. He replied: "Well—the first time I landed in the United States, it was at New Orleans, and they made me ride in a 'Jim Crow' car, but the next time I went in by way of New York, and the difference was wonderful." So, you see, many things are local issues. Even our treaties with other nations are sometimes so regarded.

Personally, I believe in the higher patriotism of the great Middle West, and I believe the farmer of to-day is nearer the typical old

stock than merchants and professional men, and that is of course why I am farming. I am getting nearer the real people.

As my old friend Bill Schwenk used to say: "On national issues, the Middle West is a mean between the Atlantic seaboard and the Pacific slope, but not as mean as either."

Affectionately,

DAD.

LETTER NO. 9—SEA SERVICE AND SERVICE WITH TROOPS

JUNE 8, 1914.

Dear Son.—I see by the papers that, after graduation, you are ordered to the *Alaska* with my friend Rand as captain. Every one, officers and men alike, try to get the newest and biggest ship there is. It is foolish, but it is one form of ambition, and certainly no one who is not looking for hard work and long hours should try for a fifteen million dollar dreadnought that is just commissioning. It appears that Rand just came ashore a little over a year ago, and one of these new rules for sea service broke him out for another cruise. Rand has had lots of sea service, but not like some officers, only because there has been no active demand for the officer's services on shore. Rand has always taken what has been handed to him by the Department, and said nothing. Even that is not always the safe thing to do, as every Plucking Board has standards of conduct of its own, and, if you don't judge values for yourself, the Department is not going to be of any help to you.

After all, each officer, except for accidents, has the making or marring of his own career pretty much in his own hands. Our navy is the only one in which the amount of sea service, shore duty, and unemployed is published, and it is a very good thing in its way. In the British Navy, officers have to be borne on the books of a ship in order to get full pay. If the little sloop, moored to the Thames embankment in London, formerly called the *Buzzard,* and now bearing the proud name plate of the *President* (to commemorate the capture of a lone American frigate by a British fleet, when a fog lifted)—if this little gunboat had on board of it the admirals, captains, commanders, and other officers whose names are borne on its books, she would go down stern first, as there are over three hundred. "President" also sounds better than "Buzzard."

I have frequently known of foreign naval officers being on shore duty for four or five years at a stretch. No navy gives the importance to sea service record that we do, and we are unquestionably right, but other navies have other ways of regulating it. In our navy, the Department has all the say about orders, and the officer, as a rule, has little to say about it. What he does say never by any chance goes on his record.

My old friend Bill Schwenk used to say that it took three men to be captain of a battleship: "One to dress well, make calls and after-dinner speeches; to speak foreign languages; dance the lancers: arrange seats at dinner; and be a diplomat. Then the scientific captain: Up on strategy, tactics, and international law, ordnance, hydraulics, ballistics, radio, electricity, and all the various kinds of boilers and engines, so that no junior officer can put anything over on him. Then the war captain: He should live in the fore hold, be fed on raw meat, and only come out when war is declared. That is the kind of captain our school histories tell the children about."

Rand comes very near having all these requirements, and you are in luck to make your first cruise with such a fine captain. Admiral Calaban once remarked that Rand's head was so level that a palm-leaf fan would come well down over his ears. After all is said, the two best assets in life are common sense and scrupulous honesty, and Jim Rand has them. Rand is 56 years old, and, in any other navy, would be a vice admiral, but I am not so sure that our system is as bad as it is painted. You must realize that our navy is the only one that goes against the popular idea of specialization. Our profession is navigating-engineer-artillery officer. In the earliest days of naval sailing ships army officers commanded, and the soldiers fought the ships. The mere navigating and sailing officers and men were a necessary evil, just as in our army transport service to-day. In time the worm turned, and swallowed the soldiers, gunners, and in our navy, at a later date, even the engineers, so that we should live happily ever afterwards. To get the proper view of our system, you must recognize that the end and aim of it is to educate and train officers for high command step by step, and it is not entirely satisfactory only because the officers are not long enough in the higher grades, but that is slowly remedying itself. We specialize our enlisted men, but not our officers. Of course, officers do voluntarily take up

special subjects, and, in the post-graduate schools, officers are required to specialize, but they are, nevertheless, required to fill any position on board ship independent of their specialty, such as navigator, gunnery officer, engineer, radio, signal, turret, secondary battery, athletic, and naval brigade on shore (infantry, or field artillery), or executive officer, and, finally, commanding officer. Foreigners try to say that we make our officers jacks of all trades and masters of none, but we have crossed the bridge of abolishing the engineer corps very successfully indeed, and we are where they fain would be.

A commanding officer in our navy is no mere torpedo, or gunnery, or ordnance, or navigating specialist promoted to captain, or commander, over the heads of others, with immature experience in other, or in all-around branches. There is no "Ask the gunnery officer," or "Ask the torpedo officer." Every officer has to pick up all he can. Our officers climb up the ladder slowly, step by step, and instead of the slicker ones passing others on the ladder, the less agile ones are invited to step down and out. In other words, our system is "selection out" instead of "selection up." This "selection out" obtains also in the German Navy. Promotion is absolutely by seniority, but the selection out is done by a blue colored letter from the Emperor saying that, appreciating all the sacrifices he has made for his country (no idle words either when you consider how little he is paid), his active service can now be spared until such time as required in case of war. Our method is more crude, more brutal, and somewhat like a public execution with all the thrills to suit a sensation-loving press and people. It is on account of the idea that our training is for high command and there is so little time left in the higher grades, that I imagine some plucking boards have tried to emphasize the importance of sea service in the upper grades, and the idea that nothing must permit this great issue to be lost sight of.

The navy owes the army much in the way of a pattern for our officers to get, by law, many of the privileges enjoyed by them, such as allowances for quarters, heat and light; promotion to the next higher grade on failing physically for promotion; longevity pay ("fogies"), etc. Naval officers have, however, no law by which they can be given a "medal of honor." Officers and enlisted men of the army, and enlisted men of the navy, may be given them for heroic action in battle, but evidently we are sup-

posed not to deserve them. As it corresponds to the "Iron Cross" in Germany, or the "Victoria Cross" in Great Britain, there is no higher honor, and it comes very near being a reflection on naval officers, but it is due rather to lack of reflection.

However, we have gone astray in this country on the whole question of medals. In no other country can an officer in uniform wear an insignia which he has inherited, as, for instance, Loyal Legion, Colonial Wars, Aztec Society, Sons of the American Revolution, etc. In every other country an officer may wear only what has been given him officially as an individual. That we should be guilty of the aristocratic and unrepublican system of inheriting valor and greatness strikes at the root of republican institutions. If you appear in Europe without any medals you are considered, according to their standards, as a nonentity, but if you wear these "sons of medals" they regard you as a fraud. It is apparently a small matter, but it belittles us. Lots of people can dispense with the necessaries of life, if they can have the luxuries, and the government should not be penurious in rewarding gallant conduct, but this country is frightened by a modest billion dollars for expenses, and economizes in small things. In most countries there are too many citizens on the government pay roll, and my old friend Bill Schwenk used to say: "The ideal country is where every one draws a salary from the government, and the government raises its revenues by taxing the salaries."

We have no national reserve in case of war, but we have every kind of uniformed societies, veteran organizations, sons of something, and descendants of past greatness. There will never be any medals, however, worth handing down from this generation if we don't look out. The number of *Mayflower* descendants has reached such proportions that one can only conclude that the immigrant authorities were awfully careless in allowing the ship to be overcrowded. Old Bill Schwenk used to say: "You can't belong to the Society of Colonial Wars just because your father worked on the Old Colony Railroad." However, my son, although you cannot get a medal of honor, I can pass my chest ornaments on to you.

In our army everything is theoretically and actually the reverse of the navy way of doing things. Officers and men are both specialized, often in branches which the navy regards as so simple as to not require the devotion of a lifetime to the mastering and

perfecting of it. For instance, an army paymaster's duties were formerly elementary; he had a clerk to do the real work, and he entered the army with the rank of major. There was no fat plum like it under the government, and the longest pole got it. The pay corps was a sort of a son-in-law club. Now all is changed.

A cadet who graduates number one from West Point is sure to be rewarded for being theoretically the best army officer by being consecrated for life to canal, harbor, and civil engineering work, with an occasional detail with troops to make him keep himself supplied with uniforms. The others of the class are assigned to the cavalry, field artillery, sea coast artillery, and the infantry. The infantry, being the real backbone of the army, is not so important as the auxiliary branches.

In the staff corps, appointments, until recently, were made by permanent transfer from the line of the army, or by appointment from civil life. The act of August 24, 1912, consolidated the Quartermaster, Subsistence and Pay Departments on the ground that each did not separately offer enough of a career to justify it as a life's profession, and now the work is done by detail. It marks one of the most important steps in the reorganization of the army. However, engineers still lay the gun foundations. Ordnance still designs and builds the sea coast guns. The sea coast artillery still simulates gratitude. Design, manufacture, supply and installations are now the subject of earnest study in the army, and the officers' colleges and schools have produced a revolution in army ideas. The real reason for all the corps and branches, as separate professions, has been to make it easy for civilians to qualify as officers, and it is this which, with civilian control, makes our army a loosely-knit organization, and one until recently lacking in centralized control, with a General Staff. When the country realizes the need for a Council of National Defense, and the navy decides it must have a General Staff, we can hope for better things. Just now the navy is in the unhappy condition of the Irishman who did not know what he wanted, but would never be happy until he got it.

The law, however, still provides that any one may be nominated as a brigadier general to fill a vacancy. Fortunately the aides and staff have to be regular officers, just as in the diplomatic service; no matter who is sent as ambassador or minister, he always has a trained secretary to act as a rubber ring to cut his diplomatic

teeth on. Fortunately the navy is sufficiently broad and exacting as to require that candidates be caught young, and that rigid examinations bar the way at each step to any form of political preferment. Even a letter from an erring Congressman or Senator to the Navy Department, in soliciting a favor for an officer, even from his own home town, is placed on the officer's record against him. Thus, my son, you see you belong to a virtuous profession.

The War Department formerly sent, as military attaches abroad, paymasters, subsistence quartermasters, signal officers, and sea coast artillery officers. It was a little puzzling to foreigners at first, as their ideas of an army are based on infantry, cavalry and field artillery, but Europe has learned many important military lessons from us, and has long since ceased to wonder. Service with troops has, however, never borne a very important relation to selection for staff appointments, or for promotion to general officers, except, of course, very recently, and the result has never commended "selection up" as an ideal allurement to the navy. Service with troops is analogous to sea service, and the so-called Manchu laws are gradually vaccinating the army. If the navy could loan the army its "Plucking Board" for a few years the cure might take.

As Kipling says:

> Ere they hewed the Sphinx's visage
> Favoritism governed kissage
> Even as it does in this age.

Or as my old friend Bill Schwenk used to say: "When the pie is about to be cut, get up well towards the pie counter. If you are off working you are apt to get overlooked."

Affectionately,

DAD.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PRINCIPLE OF SKILL

By LIEUTENANT C. C. GILL, U. S. Navy

Admiral Fiske in his exposition of the effectiveness of skill * demonstrates that its importance increases in large increments in passing from the management of the battleship to that of the division, to that of the squadron, to that of the fleet, to the management of the navy.

Few people will question the logic of this demonstration, and yet in practice the premium placed on professional skill seems to be somewhat greater on board the battleship than is the case in the Navy Department. This condition is not a recent development, and the present administration has done much to improve it. But notwithstanding recent reforms, there is still evidence of lack of skill in the operation of Navy Department machinery. In the absence of a naval war staff it would appear merely a question of arrangement whether *a definite plan for organization and training for war* should be drawn by the Secretary and his aids, by the General Board, or by the Commander-in-Chief. The important point is that naval work should proceed in accordance with a good plan. Lack of this essential would indicate violation of the principle of skill.

On board individual ships, on the other hand, a definite plan for war preparation is followed, and experts on so-called "efficiency methods" have praised ship organization and administration. Perhaps the most potent factor making for this naval efficiency is the well-defined chain of responsibility leading from the captain down to the recruit fresh from the training station. The captain is personally responsible for his ship, and is held strictly to account if he fails to keep the ship and crew prepared for service. Naturally, the captain in turn holds the officers under him strictly responsible

* See No. 155, Naval Institute PROCEEDINGS.

for the proper performance of their respective duties; and the officers hold the men responsible, thus completing the chain. This keen sense of personal responsibility makes for efficiency in more ways than one, and perhaps the most valuable way is the subtle influence it exerts in causing officers to gravitate to the billets they are personally best qualified to fill. Thus the officer well qualified to be ordnance officer is usually so billeted, while perhaps a classmate whose inclination is toward engineering work is detailed to the Engineer's Department. Divisional officers best qualified for turret work command turrets, and the experienced spotter and fire-control officer finds himself in the fire-control division. "Efficiency" from top to bottom is the watchword, and there is very little room for "special privilege."

This secret of battleship efficiency simply bears out the ancient principle that *in handling complex and difficult machinery requiring special and divers kinds of skill, both in management and operation, it is of first importance that responsibility be clearly defined and that methods be adopted which aim at getting the right man in the right place.* A reflex consequence of this principle in practice is added incentive for individuals to train themselves to increase their skill.

Although the application of this principle is not so apparent in the interior workings of the Navy Department, still, as has already been remarked, noteworthy efforts have been made to better the central managing system. For instance, the establishment of an admiralty board or navy general staff, similar to those of foreign navies, is generally conceded as desirable, and the recent creation of the office of Chief of Naval Operations is manifestly a step in that direction. The general idea of Navy Department organization outlined by Lieutenant Allen (page 863) seems to be in accord with principles the soundness of which has withstood trial in various managements, both civil and military. Improvement in the Navy Department machinery is progressing. The important preliminary steps have already been taken and, before long, the initiators of these steps will probably hit upon a satisfactory solution.

It is, however, with skill in administration that this paper has to do and not with the mechanical organization of the department. To prevent confusion of thought in following this distinction it is well, even at the risk of reiterating obvious and well-known truths,

to point out that there are two factors which make for success—one is good machinery and the other is skillful operation. These two factors are so interdependent in practice that careful analysis is often necessary to guard against drawing wrong inferences as to cause and effect. For example, let us consider two types of turrets, one fitted for mechanical loading and the other for hand loading. On trial the hand loading turret does the better. This may be due to better machinery, to more skillful operation, to both combined, or to much more skillful operation with inferior machinery. Snap judgment often considers only the first of these contingencies; that is to say, failure to get good results is attributed to poor machinery, when, in reality, it is due more to lack of skill in operation. Another reason for confusion may be found in the fact that delicate machinery is frequently ruined if badly handled. It is well known that an unskillful workman usually blames his tools for unsatisfactory results. Then, if examination reveals that his tools are dull, it may be that they were in this condition to start with and his complaints therefore justified, or it may be that his blunderings have blunted their edge.

As satisfactory conclusions would probably never be arrived at, it would profit little to try to determine whether failure to have naval work proceed in accordance with a good plan is due to poor machinery, or to lack of skill, or to both. But in facing this condition, it is well worth while to reflect upon these two interdependent factors, and to strive not only for improvement in the machinery, but also for increased skill in its operation.

In seeking practical methods for placing a higher premium on skill in the Navy Department, it would appear necessary to advance slowly by the process of experiment and improvement. The following suggestions, therefore, are offered tentatively, more with a view to elaborating a general idea than to proposing a definite scheme. In attempting this elaboration, moreover, it is borne in mind that the safest ground to start out on is that which has already been tested by experience.

In the industrial world it has been found, in filling positions calling for special kinds of skill, that a man does best at the work in which he takes most interest and that in fitting the right man in the right position much reliance can be placed on the applicant's estimate of his own ability. Honesty and accuracy are the rule and not the exception. One reason for this is that full references are

required, which, if looked up and compared with the applicant's statement, would very likely reveal any glaring errors in his self-estimate. Another reason for careful truthfulness on the part of the applicant is that it would avail him little to overestimate his abilities, because actual trial would sooner or later discover the true measure of his skill, and, if short of his estimate, would result in a loss of both position and reputation. It is therefore suggested that in seeking special skill in the Navy Department considerable weight can be given to the estimate which each officer makes of his own abilities.

Examinations are another means of determining a man's knowledge and abilities. This method has received wide and various application and is so well known that little need be said about it here, save perhaps to point out that its success depends largely upon the character of the abilities to be determined; and, however sound examinations may appear in theory, they have been found in practice frequently unsatisfactory and sometimes even misleading. It is safe to assume that, in an attempt to get skill, examinations would be useful only to a very limited extent. Examinations measure knowledge more than they do skill.

Much attention has been given recently to preparing the individual records of naval officers and developing a system by which the information to be derived therefrom may be accessible in convenient form. These records should supply valuable help in applying the principle of skill, but there are pit-falls to guard against, and it would appear a simple matter to draw wrong inferences. There is necessarily lack of uniformity in standards for marking, and while these records supply a useful guide, they should generally be taken with mental reservation.

Professional reputation gives still another means of determining whether or not a man is suitable for a particular position. Were it possible to take a true measure of this desideratum much confidence could be placed therein. But here again the pit-falls are obvious. The sources of information would have to be submitted to searching scrutiny and would also have to be wide in range, or injustice might easily be done.

An apposite example of the successful application of the principle aiming at getting the right man in the right place is seen in the way the army fills vacancies existing in their Ordnance

Department. This method is described in a last year's issue of the *Army and Navy Journal* as follows:

> Examinations were held at various places on January 26 of officers desiring to be detailed to fill vacancies existing in the Ordnance Department on June 20 next. The details will be made upon recommendation of a board of ordnance officers convened as soon as practicable after the receipt of the examination papers. Officers that already have served in the Ordnance Department and will have had at least a year's service with their commands by June 20 also will be eligible to detail, but they will not be required to take the examination. They are authorized to apply to the adjutant general of the army for detail, calling attention to any matters of record that they desire to have considered by the board convened for the purpose of making recommendations for selection.

Though not specifically stated, it may be inferred that, speaking broadly, the recommendations made by the above-mentioned board of ordnance officers were based on statements made by the applicants themselves, on examinations, on official records, and on professional reputation.

It may be reasoned that somewhat similar methods might be used to advantage in the navy, not only in filling vacancies in the Ordnance Department and Gun Factory, but also in the Judge Advocate General's Office, Office of Naval Intelligence, naval attaché assignments, and the high executive positions wherein it is so important to get special skill.

> NOTE.—It might be feasible to have a naval board on details composed of two parts. The standing part to consist of, say, three officers in the Bureau of Navigation and the variable part to consist of two officers on duty in the bureau or office appropriate to the particular vacancies respecting which recommendations for detail were to be made. For example, if vacancies calling for engineering work were under consideration, then the variable part of the board would comprise two officers on duty in the Bureau of Steam Engineering.

Of course, nothing original is claimed in this brief discussion of a very old subject, nor is it intended to imply that the principle of skill is disregarded in making assignments by methods now in use. On the contrary, it has been pointed out that recent improvements have been made and that important steps toward better management are now in progress. But in spite of this and because so little is known of the way the navy is managed, the feeling, whether justified or not, is prevalent throughout the service that the Navy Department is not as free from the evil influences of special privilege as it might be. It is, therefore, reasonable to suppose that

any open steps taken to increase the premium placed on skill in the central plant, to which all should look for precept and example, would increase the general content, promote cheerful cooperation, and supply an additional incentive—in the words of Admiral Fiske—"To train strenuously to increase our skill."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A DISCUSSION ON NAVAL MANAGEMENT

By LIEUTENANT (JUNIOR GRADE) E. G. ALLEN, U. S. Navy

Our navy to-day—the navy of the steel ship—is nearing the crest of its career. The perfection in every form of propulsion and in every form of offensive and defensive material seems to be reaching a limit. This combined meanwhile with the partial conception and realization of a fleet, of a naval policy, with its purpose, mission and future; the bringing war college to fleet and fleet to war college, has opened our eyes to our possibilities and limitations; and after 15 years of endeavor to improve the tool we are pausing seriously to divert our effort from the material making of a finished weapon to the finished weapon's use.

Having a perfected tool for an enterprise, we find essential for its effective use certain factors; namely, personnel, organization, policy, doctrine, decision and execution. In a commercial body they are essential; in a military body vital, for, in time of war, the very life of the enterprise depends upon what the individual and collective development of each has been.

All these we recognize and have developed more or less, one (material) to a high degree. Through the medium of an organized fleet, of a War College, of a General Board, of highly technical bureaus, we have reached the point where we see the importance and relation of these factors, but, curiously enough, we students, disciples, and experts in organization are inherently weak in our main and central organization, and consequently in policy, decision and execution. Knowing what we want and how to do it, and even having the necessary factors, we lack the drive to accomplish, through a defect in the central organization, the Navy Department. (In short, we cannot walk because our spine is affected.)

In the correction of this defect lies the solution of most of our problems. Having brought the organization of ship and fleet, in respect to the division of authority and responsibility, to as perfect a form as can be devised, we now should bring to the department itself a similar organization, welding on the chain a last link which rightly should have been the first.

To enter the history of the matter in explanation:

In the infancy of our navy ships were built, manned and operated as best they could be with little or no direction or instruction from the seat of government. As the navy increased and squadrons were formed, necessity established more central control, and in accomplishing this, the various bureaus were formed under a Secretary. As the navy increased and grew, so did the bureaus, constantly becoming more powerful and cumbersome, and, being on the same footing, continually increasing in rivalry and jealousy.

In this modern time of business efficiency and centralized authority a change was bound to come, and it resulted in our present system of advisory aids.

This system in a measure has co-ordinated the bureaus. Its inherent weakness, of course, is that it is an advisory and not an executive control.

The installation of the advisory aids should, however, not be minimized, for under it the General Board, War College, organized fleet, and its organized units have flourished—not too abundantly—but still flourished. It has been a step in our evolution, we have sounded its possibilities, got what we could from it, and should now move on. It has given us the elements of an effective naval administration. What we need now is an organization to co-ordinate each in its appropriate function.

To illustrate the working of our present system: Suppose we took a brand new dreadnought about to be put in commission and picked a man from civilian life, doctor, lawyer, merchant, banker, business man of any description, but necessarily a politician, and placed him in command of the ship. We now give him four advisory aids, each with the same advisory power, but nothing more. We next turn over the various heads of department, gunnery, executive, engineering, first lieutenant, etc., to officers senior in rank to the aids and with executive power. What do you suppose the status of that ship would be as regards movement and efficiency? I can't believe she would leave the dock.

In this connection there is no question of the necessity for a civilian Secretary of the Navy. He is the assurance to the republic that there is no possibility of military supremacy or despotism, the bug-a-boo of the American people. He is the guarantee that the military is subordinate to the civil government; that the money is spent wisely and the navy administered properly. But, however able he be, however closely his sympathies are allied to the country's defense or to the navy's needs and aims, limited by short terms of office, by party affiliation, by ignorance of yard, ship, and fleet, by the wildest stretch of imagination it cannot be supposed that every four years a new Secretary can assume office and *personally* administer the navy efficiently.

The navy, however, is permanent; it is, has been, and will be. Our policy of defense must be directed constantly with one aim over long periods of years. Moreover, we outlast parties and administrations; it is therefore only just that we should have a coordinated organization authorized by law that will grind on year by year and not be subject to periodic upheavals and adjustments at four-year intervals. The authority should unquestionably be vested in the Secretary, but the organization should be such that the wheels of the navy will always turn smoothly and in the same and right direction.

To further illustrate the working of the present scheme: Suppose the General Board suggests an organization for the fleet, well thought out, adapted to the best interests of the service. It passes through the various aids, accumulates endorsements, each in general favorable, but each indicating a difficulty colored by the character of the bureaus under the aid. The bureau chiefs next endorse it approved in general, but in each instance indicating a minor difficulty of money, men, officers, machinery, or what not. The matter is now laid before the Secretary, each aid giving the viewpoint of his bureaus. The matter makes no particular appeal to the Secretary, and owing to the difficulties, delay and inaction result, and the over-endorsed paper finds its way to the file room, the graveyard of many a good hope. The fault here is in the navy itself, in its organization. If the matter had been presented by one man with executive authority who could prove the idea good, feasible, explain the difficulties, show their solution, the result would undoubtedly be an order to do. The one man with the executive authority turns to his aids, delegates each his part, or-

dering one bureau to sacrifice here, another there, and we get the result.

What we lack is a directive force with power to direct. What we have is a compromise of disjointed elements that continually jostle and create friction. We have no one to decide definitely the relative value of things, which to sacrifice, which to favor to procure a result. There are innumerable solutions for an organization to effect this, but each must involve some form of a *chief of staff,* or to adopt a better term, *executive of the navy.* He will carry the responsibility and will be the guarantee for the results. If a ship is to be moved, when he presents the order for signature he has all the strings in his hand, the necessity, the personnel, the material, the supply. If anything fails, he has the responsibility, but he also has the authority and the power to lay his hand on the weak point and weed it out.

In the installation of any system of executive chief of staff and general staff, the one which will stand the most or any chance of success will be one that will accomplish its work with the fewest upheavals, dissensions and innovations. Any system which does not actually co-ordinate the bureaus, include its chief, and avail itself of their expert knowledge and co-operation, is bound to come to grief.

In other words if we suddenly hoist on the Navy Department a chief of staff with a staff of youngsters bearing "holier than thou" banners and leave the bureau chiefs outside with their present status unchanged, authorized by law with definite functions and perhaps senior to the chief of staff, and, on the side, have a General Board of greybeards of ripe experience and of high rank, we shall tend to produce a condition in which the old bureau dissensions will look like the preliminaries before a main bout.

The following is an attempt to illustrate a method by which this could be done; namely, to give the navy its General Staff, and, at the same time co-ordinate the bureaus and produce an organization that would work in harmony, without friction. Under this system a development of the General Board would become the General Staff with their old functions as part of the new ones.

The following points seem essential:

1. The relation of the executive and the General Board should be intimate and close; it should be his brain and information and he should be its chief.

2. The executive should have two executive aids under whom the bureaus are distributed; one for personnel, one for material.

3. The General Board should have one function, "to prepare the navy for war." This work to be divided under three divisions: (1) Active plan, to include maneuvers, mobilization, operation of the active and reserve fleets, (2) war plan (ship design, bases, campaign plans, etc.), (3) information.

4. Under the division of information the Office of Naval Intelligence should be placed and should be required to supply the intimate knowledge necessary to prepare a campaign against probable enemies. It should be given the means, money, officers, and men to collect this information. We seem lamentably weak in our use of naval intelligence.

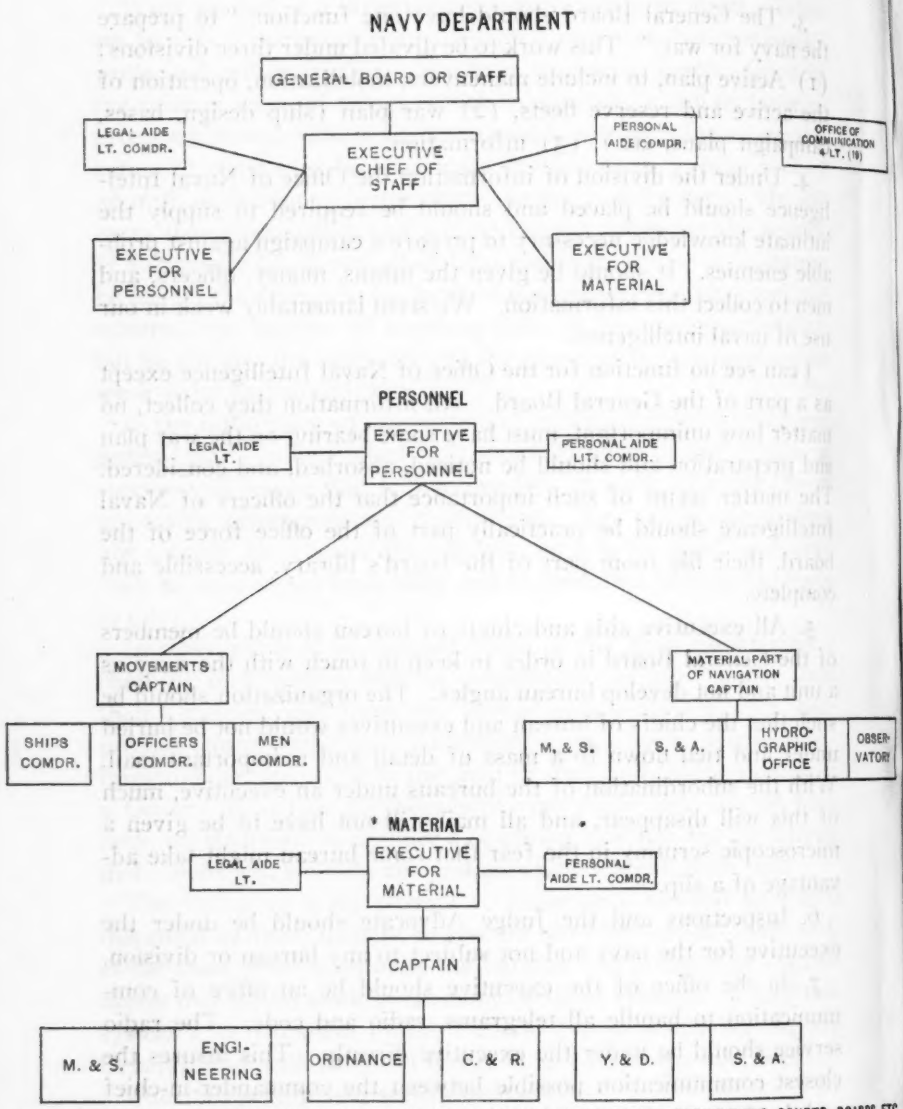
I can see no function for the Office of Naval Intelligence except as a part of the General Board. All information they collect, no matter how unimportant, must have some bearing on the war plan and preparation and should be noticed, absorbed, and considered. The matter seems of such importance that the officers of Naval Intelligence should be practically part of the office force of the board, their file room part of the board's library, accessible and complete.

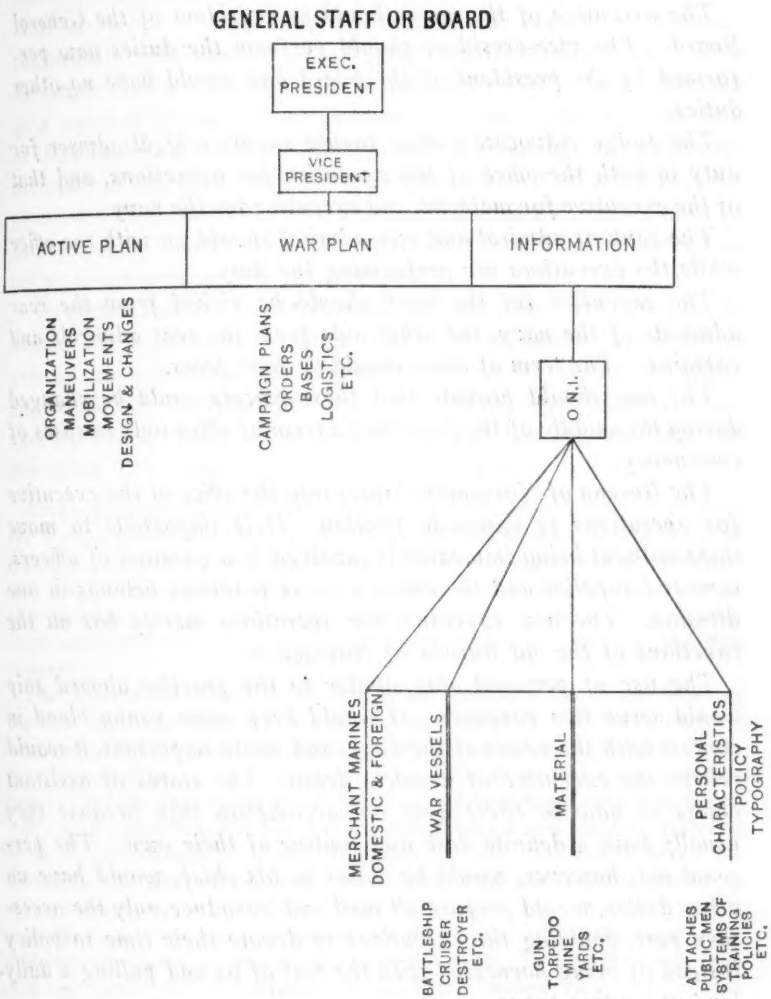
5. All executive aids and chiefs of bureau should be members of the General Board in order to keep in touch with the navy as a unit and not develop bureau angles. The organization should be such that the chiefs of bureau and executives would not be buried under and tied down to a mass of detail and unimportant mail. With the subordination of the bureaus under an executive, much of this will disappear, and all mail will not have to be given a microscopic scrutiny in the fear that some bureau might take advantage of a slip.

6. Inspections and the Judge Advocate should be under the executive for the navy and not subject to any bureau or division.

7. In the office of the executive should be an office of communication to handle all telegrams, radio and code. The radio service should be under the executive directly. This insures the closest communication possible between the commander-in-chief and the department.

The following sketches illustrate the general outline of such an organization:


NAVY DEPARTMENT
GENERAL BOARD OR STAFF
LEGAL AIDE LT. COMDR.
EXECUTIVE CHIEF OF STAFF
PERSONAL AIDE COMDR.
OFFICE OF COMMUNICATION 4 LT. (19)
EXECUTIVE FOR PERSONNEL
EXECUTIVE FOR MATERIAL
PERSONNEL
LEGAL AIDE LT.
EXECUTIVE FOR PERSONNEL
PERSONAL AIDE LIT. COMDR.
MOVEMENTS CAPTAIN
MATERIAL PART OF NAVIGATION CAPTAIN
SHIPS COMDR.
OFFICERS COMDR.
MEN COMDR.
M. & S.
S. & A.
HYDRO-GRAPHIC OFFICE
OBSER-VATORY
MATERIAL
LEGAL AIDE LT.
EXECUTIVE FOR MATERIAL
PERSONAL AIDE LT. COMDR.
CAPTAIN
M. & S.
ENGI-NEERING
ORDNANCE
C. & R.
Y. & D.
S. & A.
LEGAL AIDES TO BE AUTHORITIES ON MILITARY, CIVIL AND INTERNATIONAL LAW, CONTRACTS, REQUISITIONS, COURTS, BOARDS, ETC.


GENERAL STAFF OR BOARD
EXEC. PRESIDENT
VICE PRESIDENT
ACTIVE PLAN
WAR PLAN
INFORMATION
ORGANIZATION
MANEUVERS
MOBILIZATION
MOVEMENTS
DESIGN & CHANGES
CAMPAIGN PLANS
ORDERS
BASES
LOGISTICS
ETC.
O.N.I.
MERCHANT MARINES
DOMESTIC & FOREIGN
WAR VESSELS
MATERIAL
PERSONAL CHARACTERISTICS
POLICY
TYPOGRAPHY
BATTLESHIP
CRUISER
DESTROYER
ETC.
GUN
TORPEDO
MINE
YARDS
ETC.
ATTACHES
PUBLIC MEN
SYSTEMS OF
TRAINING
POLICIES
ETC.

In the sketch the following factors are not shown but are necessary:

The executive of the navy should be president of the General Board. The vice-president should perform the duties now performed by the president of the board and would have no other duties.

The Judge Advocate's office should supply a legal adviser for duty in both the office of the executive for operations, and that of the executive for material, and executive for the navy.

The rank of admiral and vice-admiral should go with the office while the executives are performing the duty.

The executive for the navy should be picked from the rear admirals of the navy, the other aids from the rear admirals and captains. The term of office should be four years.

The law should provide that these officers could be changed during the middle of the Secretary's term of office only in cases of emergency.

The Bureau of Navigation lapses into the office of the executive for operations to eliminate friction. It is impossible to move ships without being immediately involved in a question of officers, men and supplies and the entire subject naturally belongs in one division. The new executive for operations merely has all the functions of the old Bureau of Navigation.

The use of personal aids similar to the practice aboard ship would serve two purposes. It would keep some young blood in contact with the heads of the navy, and, more important, it would relieve the executive of needless detail. The status of assistant chiefs as now in effect does not accomplish this, because they usually have a definite desk and routine of their own. The personal aid, however, would be closer to his chief, would have no other duties, would prepare all mail and introduce only the necessary part, enabling the executives to devote their time to policy instead of being harnessed with the rest of us and pulling a daily load of routine paper.

However self-evident or inadequate this short outline of a re-organization may be, its excuse is the value of persistence in an idea which should be permeating to every strata of the service. When this is accomplished the clamor and insistence from every hand will insure its installation.

The main point to bear in mind is that the "acid test" for a military organization is "Does it prepare for—would it be used in time of—war?" Applying this test to our present department organization, the most impartial judge would answer "No." The department whose mission is to prepare the navy for war, through long years of peace and of contact with the political machinery of the country, leans to a condition where its energy and endeavor are aborted into machinery for the expenditure of an annual appropriation. This condition produces an organization we know to be faulty, for in time of war the department would be compelled to resort to some form of a general staff.

To escape this fetich of material and of money expenditure, to isolate the organization from contact with party policies and politics, to insure the department functions for its proper duty, and to fix the responsibility and insure results, we must have an executive naval head and staff authorized by law for one duty and one alone, "To administer and prepare the navy for war."

Note.—*In connection with this article it is interesting to note how much the Navy Department Building itself has hampered changes and fostered the bureau control. The State, Army and Navy Departments are crowded into one building. The offices are so scattered, the old grooves so worn, that everything tends to keep the bureau spirit alive. Paper work is endlessly duplicated; decisions take weeks that should be given by one man instantly.*

The General Board and Naval Intelligence, which should be the brain of the man who runs the navy, are in another building. The Naval Library, which should be the lounging room of the General Board, is isolated at the top of the building. The bureaus are so scattered about that it takes mail as long to circulate as it would to carry on the correspondence with New York.

We need a new organization, but we should have a new building designed to fit the requirements of the organization; one that would bring the Secretary, his executives, their office force, and the General Board in closer contact and understanding.

In this connection it is my opinion that the chief clerks of the department and bureaus should be retired officers of the navy. This to eliminate friction and make for co-operation between the civilian employees of the department and the naval officers who are on duty in charge, and to have some naval officers who are permanent and intimately connected with all details.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SHIPS OF THE UNITED STATES NAVY

AN HISTORICAL RECORD OF THOSE NOW IN SERVICE AND OF THEIR PREDECESSORS OF THE SAME NAME

1776–1915

By ROBERT W. NEESER

ARIZONA

ARIZONA.—One of the United States, in the region ceded by Mexico in 1848. It formed part of the Territory of New Mexico until 1863, when it was organized as a separate territory. Arizona was admitted into the Union as a state in 1912.

The battleship *Arizona*, authorized by the act of Congress approved March 4, 1913, is the third ship of the United States Navy to bear the name. She is to be a duplicate of the battleship *Pennsylvania*, appropriated for in 1912, except in her propelling machinery, which is to be of the Parsons type. Her general dimensions are as follows: length, 608 feet; breadth, 97 feet ½ inch; draft, 28 feet 10 inches; displacement, 31,400 tons; total fuel oil storage, 2322 tons; speed on trial, not less than 21 knots. Her armament will comprise a main battery of twelve 14-inch B. L. R.'s and four submerged torpedo tubes, and a secondary battery of twenty-two 5-inch R. F.'s, four 3-pounder saluting guns, two 1-pounder boat guns, two 3-inch field pieces, and two .30-caliber machine guns. She is to have two triple-gun turrets forward and two aft on a center line; also two fire-control towers; a single funnel, and two boat cranes. The *Arizona* is now under construction at the New York navy yard.

The second *Arizona* was a first-class screw frigate built by the government at the Philadelphia navy yard in 1863 and launched on October 5, 1865. She was a wooden vessel of 3850 tons, 335 feet length, 44 feet 4 inches breadth, and 11 feet 4 inches draft. Her engines, which were built at the Etna Iron Works, consisted of two horizontal direct-acting engines and twelve boilers. Her proposed armament was to include 13 pieces of various calibers.

The *Arizona* was originally known as the *Neshaminy*, her name being changed on May 15, 1869, and again on August 10 of that year to *Nevada*, consequently she appeared under the name *Arizona* in but a single issue of the *Navy Register*.[1] In 1869 she was in ordinary at New York. Three months later she was examined by the Goldsborough Board and condemned as "a lamentable and glaring instance of a waste of efforts, and a downright squandering of means." "The predominant idea in getting her into existence," the report concluded, "seems to have been the production of a sort of overgrown Indian canoe in shape and lightness, and thus to obtain speed at all hazards, no matter what might become of other indispensable qualities; and the result has been, as it were, scarcely anything less in effect than—pardon the expression—a slunk foal." So the *Arizona*, which by that time had already been rechristened the *Nevada*, was left in the state in which the board found her, and was eight years later turned over by the Navy Department to J. Roach (March, 1877), in part payment for the rebuilding of the monitor *Puritan*.

The first *Arizona* was bought at Philadelphia on January 23, 1863, by Commodore C. K. Stribling. She was an iron side-wheel steamer of 959 tons and had been launched in 1859. Her dimensions were: length, 200 feet; breadth, 34 feet; depth of hold, 17 feet ½ inch; draft, 8 feet. She had one beam engine of 11 feet stroke, and one boiler. Her complement was 9 officers and 82 men. The *Arizona*, on March 13, 1863, was armed with one 30-pounder Parrott, four 32-pounders of 42 cwt., and one 12-pounder Parrott. This armament was, on June 15, 1863, increased by the addition of one 32-pounder of 33 cwt., and, in September, 1864, again changed to one 30-pounder, four 57-cwt. 32-pounders, and two 12-pounder howitzers.

The *Arizona* sailed from Philadelphia in command of Acting Volunteer Lieutenant Daniel P. Upton, for duty under Rear Admiral Farragut in the West Gulf blockading squadron. On her passage down the coast she fell in with the sloop *Aurelia*, off Mosquito Inlet, Fla., on March 23, 1863, and sent her into port for violating the blockade. Immediately upon joining the squadron, the *Arizona* was ordered to proceed to Berwick Bay to cooperate with the *Estrella* and *Calhoun* and the Union land

[1] In the issue of July 1, 1869.

forces under General Weitzel. While transporting the troops, on April 14, the vessels came upon several Confederate ships, one of which was the ram *Queen of the West*, "the strongest ship they had," which they had only two months before captured from the Federals. The Union gunboats lost no time in bringing their bow-chasers into play, and the *Queen of the West* was soon wrapped in flames fore and aft, her consorts making all steam up the river. Five days later, Captain Upton was ordered to reconnoitre Butte-à-la-Rose, La., on the Atchafalaya, and on the 20th the *Estrella*, *Clifton* and *Calhoun* joined him in a successful attack upon the fort. This victory by the gunboats operating from the south had far-reaching effect, for it opened a side entrance through to the Red River by which vessels could pass from the Gulf without entering the Mississippi. General Banks therefore immediately determined on an expedition to attack the city of Alexandria, the great depot of the Confederates on the Red River. Admiral Farragut heartily endorsed the plan, but he had not enough vessels to spare. So the *Arizona* and *Estrella* were ordered to cooperate with Admiral Porter's rams and ironclads. On arriving at Fort De Russy, that work was found deserted. Alexandria was taken possession of without opposition on the morning of May 7. "General Banks, who had not expected such celerity of movement, arrived with the army only that night, and Porter turned the city over to him," withdrawing his vessels owing to the falling waters. Three days later the *Arizona* was before Fort Beauregard at Harrisonburg, La., with two of Porter's gunboats, the *Pittsburg* and *General Price*, but though over a hundred shots were fired into the work, no damage was inflicted and only one house in the town was destroyed.

In August, 1863, Acting Master Howard Tibbits relieved Lieutenant Upton in command of the *Arizona*. Then followed the disastrous expedition to Sabine Pass, Tex., on September 8, 1863, where the Confederates were reported to have but two pieces mounted on shore and two small vessels on the river. Four thousand troops under Major General W. B. Franklin accompanied the flotilla, which consisted of the *Clifton*, the *Sachem*, the *Arizona* and the *Granite City*. The gunboats made the first attack, assisted by 180 sharpshooters from the army. But, for some unaccountable reason, the engagement was not opened until more than 24 hours after the expedition appeared off the

Sabine. The *Clifton, Arizona* and *Sachem* engaged the battery, which was found to mount many more pieces of artillery than anticipated. A shot pierced the *Sachem's* boiler and in a few moments she was enveloped in a cloud of steam. The *Clifton* also was disabled and compelled to surrender. Then the *Arizona* met with a mishap; she ran on shore, and the only remaining Union vessel afloat had to stand by and get her off, while the troops watched the proceedings from the decks of the transports.

From the inland waters, the *Arizona* was ordered to duty on the blockade in the Gulf of Mexico. But in November, 1863, an epidemic of yellow fever broke out on board, which increased to such an extent that the ship became inefficient from the loss of men. This compelled her to leave her station and return to New Orleans, whence she proceeded "up the Mississippi River on account of the health of her crew." After her return to duty, the *Arizona* was again ordered on the blockade and remained, in May, 1864, off Galveston, Tex., and in San Luis Pass; in June, off Pass Cavallo; and, in July and August, off Sabine Pass.

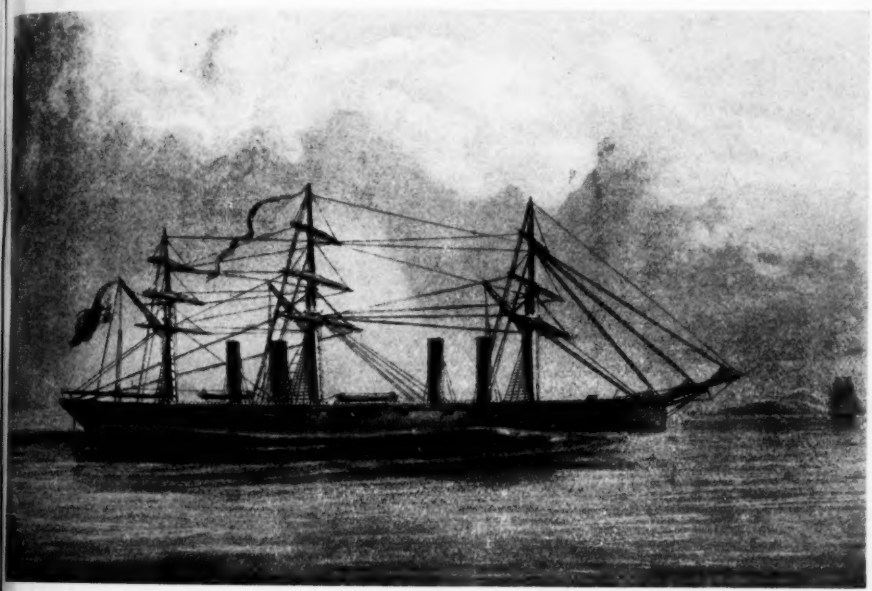
In September, 1864, Captain Tibbits returned to New Orleans, with a very unfavorable opinion of his ship's seagoing qualities. A survey of her was therefore ordered, and she remained at anchor off the city. In January, 1865, Captain Tibbits was succeeded in command by Lieut. Commander George Brown. On account of her light draft, the *Arizona* was fitted for use as a temporary flagship, but before she could be occupied as such she caught fire in the Mississippi River, on February 27, 1865, and was totally destroyed.

PENNSYLVANIA

PENNSYLVANIA.—One of the thirteen original states. The name is compounded of Sylvania, meaning forest country, and Penn, the name of its founder to whom the land was ceded by Charles II in 1681. It was first settled by the Swedes in 1638, but under the government of the Penn family, which lasted until the Revolution, it was colonized by the English, Scots, Irish, Germans, Dutch, and French Huguenots.

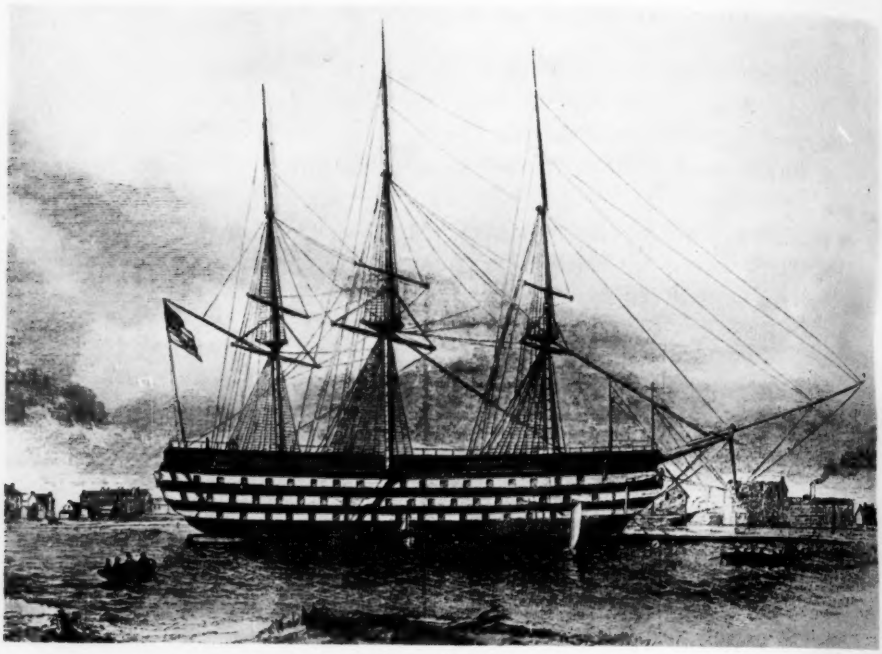
The super-dreadnought *Pennsylvania*, now under construction at the Newport News Shipbuilding Yard, Va., is the fifth ship to bear the name of the Keystone State. Her construction was authorized by act of Congress approved August 22, 1912. She is a vessel of 31,400 tons displacement, with the following dimensions: length, 608 feet; breadth, 97 feet ½ inch; draft, 28 feet

10 inches. Her designed speed is 21 knots, with a total shaft H. P. of 32,000 for her improved Curtis turbines. Her armament will consist of twelve 14-inch B. L. R.'s, mounted in four turrets, supported by a torpedo defense battery of twenty-two 5-inch guns. She is also fitted with four submerged torpedo tubes. Her distinguishing features, above deck, are to be two fire-control masts, one smoke-stack, and fore-and-aft triple-gun turrets for her battery guns.

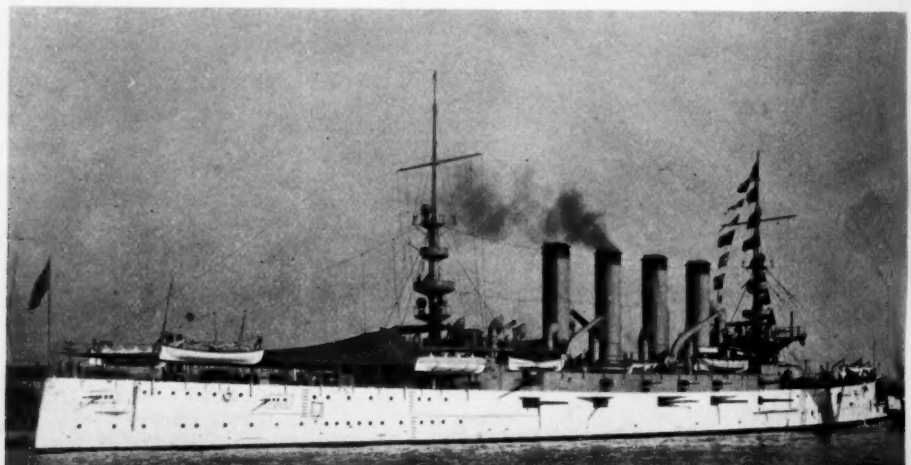


U. S. S. "NESHAMINY," "NEVADA," "ARIZONA," 1863-1877. TWICE RENAMED

Her predecessor was the armored cruiser *Pennsylvania*, now known as the *Pittsburgh*, one of the vessels of that class authorized by Congress in 1899 as a result of the lessons of the Spanish-American War. She was built by William Cramp & Sons, at Philadelphia, Pa., at a cost of $3,890,000, and was launched on August 22, 1903. She is a vessel of 13,680 tons displacement, and has the following dimensions: length, 502 feet; breadth, 69 feet 6½ inches; draft, 24 feet 1 inch. Her engines are of the vertical triple-expansion type, of 28,600 H. P., for which steam is supplied by 32 Niclausse boilers. Her bunker capacity is 1825 tons of coal, and her trial speed is 22.44 knots.



SHIP-OF-THE-LINE "PENNSYLVANIA," 1ST



U. S. S. "PENNSYLVANIA"

For protection against an enemy's fire, the ship has a water-line belt tapering from 5 to 6 inches, and a protective deck 4 inches in thickness. Her entire superstructure is armored, and she has, in addition, 5-inch armor over her broadside battery. On the turrets are 6½ inches of steel, while the conning tower is protected by 9-inch armor.

There have been several minor alterations in the battery of the *Pennsylvania* between the time when she first went into commission and the date of her change of name. Originally her armament consisted of four 8-inch B. L. R.'s in pairs in turrets forward and aft, fourteen 6-inch R. F.'s mounted in broadside, eighteen 3-inch R. F.'s, twelve 3-pounders, eight 1-pounders, two 3-inch field pieces, and eight .30-caliber machine guns. She also had two 18-inch submerged torpedo tubes. In 1906, this armament was decreased by the removal of six 1-pounders and two .30-caliber automatics; four years later (1910), two more .30-caliber automatics were taken off. The ship's complement comprises 14 officers and 791 men.

For two years after she was authorized, the ship was known as the *Nebraska,* but in the *Navy Register* for July, 1901, her name was changed to *Pennsylvania,* and thus she was called until August 28, 1912, when she was renamed the *Pittsburgh.*

The *Pennsylvania* went into commission at the League Island navy yard, Pa., on March 9, 1905, under the command of Captain Thomas C. McLean, and after a brief shaking-down cruise in June, she joined the armored cruiser squadron until she was attached to the Atlantic fleet in November of that year. In September, 1906, she proceeded to the Asiatic Station, via the Suez Canal, in company with other vessels of her class, arriving at Woosung, China, on March 17, 1907. Here Captain Aaron Ward relieved Captain McLean (March 21, 1907), remaining in the Far East with the cruiser division until August. On February 23, 1908, the *Pennsylvania* went to Bremerton, Wash., and underwent necessary repairs, remaining at the navy yard in charge of Lieut. Commander Harrison A. Bispham (March 5, 1908) until May 1. On that date she went to sea, under Captain Frank A. Wilner (March 17, 1908), with the first squadron of the Pacific fleet, cruising along the coast and engaging in the usual evolutions and exercises until her return to Bremerton in June, 1909. Captain Charles F. Pond assumed command of the

Pennsylvania on July 4, 1908. For the next two years the ship was continuously in service. Then, in June, 1911, she returned to Puget Sound for repairs, and on July 1st she was placed in first reserve at that yard. In 1912 the ship performed various services with the Naval Militia. Her commanding officers on those occasions were Commander Warren J. Terhune (March 16, 1912) and Lieut. Commander Henry N. Jenson (May 8, 1912).

The third *Pennsylvania* was a "seagoing coast-line battleship" of 14,948 tons displacement authorized by act of Congress on March 3, 1899. She was built at the shipyard of Moran Brothers at Seattle, Wash. For two years she was borne on the *Navy Register* as the *Pennsylvania,* but in the spring of 1901 she was renamed the *Nebraska*—the name originally assigned to the armored cruiser *Pennsylvania.*

From 1864 until 1884, the United States Navy was credited with having a squadron of 21-gun screw sloops that, on paper, was very formidable. They were known as the *Connecticut* class, and one of them was the *Kewaydin,* which, on May 15, 1869, was renamed the *Pennsylvania.* But, of the nine vessels, only five were ever completed, and the majority of these were soon placed out of commission and laid up at the navy yards.

The *Pennsylvania* was a screw sloop of 3953 tons displacement. She was built by the government at the Boston navy yard, her keel being laid in 1863. Almost $469,000 was spent in her construction and $1958.62 more for repairs, but she never was completed. And in 1884 she was still on the stocks, when she was broken up and sold. Her principal dimensions were: length, 312 feet 6 inches; breadth, 46 feet. Her machinery, which was built by H. Loring of Boston, consisted of two horizontal back-action engines for which steam was to be supplied by four main and two superheating boilers.

The proposed armament of the sloop was very powerful. There were two 100-pounder Parrott rifles, one 60-pounder, two 30-pounders, twelve 9-inch smoothbores, and four howitzers. But the shape of the *Pennsylvania's* gun-deck was such, that not a single gun in her battery could be used in giving chase to an enemy ahead, while even the use of her stern guns would have been essentially hampered owing to the want of proper room.

It was well that the vessel was never launched. The report of the Goldsborough Board in 1869 laid such emphasis upon the many shortcomings of the vessels of her class that, as soon as the opportunity offered, she and her sister ships were gladly disposed of. They had neither canvas nor steam to fit them for ocean-going cruisers; "cramped room for everything, except the steam machinery," was evident in their design, which was characterized as a "sad and signal failure, utterly unfit to be retained in the service, and too much of an abortion to be worthy of the large expense that would have to be incurred." So no further efforts were made to complete the *Pennsylvania,* and she remained on the stocks until her disposition in 1884.

The first *Pennsylvania* was a 120-gun ship-of-the-line, "not only the largest in our navy, but the most magnificent in point of model and construction." She was one of the vessels authorized by Congress on April 29, 1816. She was built at the Philadelphia navy yard. Her keel was laid in 1822 and she was launched on July 18, 1837. She was a wooden vessel of 3241 tons, ship-rigged, and of the following dimensions: length, 210 feet; extreme breadth, 56 feet 9 inches; depth of hold, 23 feet. Her cost of construction was $694,500, and the amount expended in repairs upon her from 1837 to 1861 was $95,694.06. In October, 1841, her battery consisted of four 8-inch smoothbores, twenty-eight long 32's, and twenty-two 32-pounder carronades. In 1850 she mounted sixteen 8-inch smoothbores, and one hundred and four long 32-pounders. Her complement was 1100 men.

Commodore Charles Stewart was ordered to take command of the *Pennsylvania* in the fall of 1837, and did so on October 27. The orders received from the Navy Department, which "produced a deep and universal dissatisfaction among the citizens of Philadelphia, and indeed of the whole state," were to equip the vessel for sea and bring her to the Norfolk, Va., navy yard to be coppered. "Large and spirited public meetings were convened to remonstrate against the measure, and to urge upon the Executive the necessity of having her completed in the yard where her keel was laid, but the determination of the Department was irreversible. The want of a dry dock at Philadelphia was the alleged ground of justification of the procedure."

So on December 18, 1837, the *Pennsylvania* slipped her cables off Philadelphia, never to return. On January 8, 1838, Lieutenant John M. Dale succeeded Commodore Stewart in command of the ship, and shortly after she was placed in ordinary. In 1842 the *Pennsylvania* was placed in commission as a receiving ship at the Norfolk yard, and this service she performed from this date until the outbreak of the Civil War. Her commanding officers during this period were: Captain John P. Zantzinger (1843), Captain Joseph Smoot (1845), Commander Cornelius K. Stribling (1846), Commander Hugh N. Page (1848), Commander Samuel Barron (1848), Commander John L. Saunders (1851), Commander John Manning (1854), Commander John R. Tucker (1856), Commander Murray Mason (1859), Commander Frederick Chatard (1860). Commander Chatard remained in command until the destruction of the Norfolk navy yard, on which occasion the official reports mention Lieutenant Edward Donaldson as "senior officer remaining on board the ship April 20, 1861, when she was destroyed."

There have been two other vessels of our navy also named after the State of Pennsylvania, but known in service as the *Keystone State*. The most recent of the two was the old 18-gun sloop-of-war which, until November 30, 1904, was known as the *St. Louis*. She was a wooden vessel of 830 tons displacement, 126 feet 6 inches length, and 33 feet 9 inches beam. From 1904 to 1906 the *Keystone State* was borne on the *Navy Register* as "unserviceable" and assigned to the Naval Militia of Pennsylvania for practice. On August 9, 1906, she was stricken from the navy list and ordered to be sold.

The first *Keystone State* was a side-wheel steamer of the third rate, bought in Philadelphia on June 10, 1861, from A. Heron, the agent of the Ocean Steam Navigation Company. She was a wooden brig-rigged vessel of 1364 tons, 320 feet length, 35 feet beam, 21 feet depth of hold, and 14 feet 6 inches draught. She had been launched in 1853 at the shipyard of J. W. Lynn, in Philadelphia, and was purchased by the government for $125,000. She had one side-lever engine of 96 inches stroke, and two boilers. Her speed was estimated at 9½ knots, though in 1864, while in chase of a Confederate cruiser, she actually maintained a speed of 11½ knots for several hours.

During the Civil War, the *Keystone State* had her battery changed many times. Her original armament (April 19, 1861) was four 12-pound howitzers. This, in May, 1861, was changed to four 32-pounders of 27 cwt. On May 4, 1863, she mounted one 50-pounder Dahlgren rifle, two 30-pounder Parrott rifles, three 8-inch smoothbores, two 32-pounders of 57 cwt., and two rifled 12-pounders. On June 2, 1863, there were six 8-inch guns, two 32-pounders, two 30-pounder rifles and one 150-pounder Dahlgren rifle. Then on December 31, 1863, the authorities remounted the same battery she had in May, 1863, but in May, 1864, they removed one 50-pounder, one of the 8-inch guns, and the two howitzers, and on June 27, 1864, they took off still another piece, one of the 30-pounders, and substituted therefor a 50-pounder Dahlgren rifle. Her complement was 17 officers and 163 men.

While the *Keystone State* officially became a public-owned cruiser only in June, 1861, her actual service under the colors really began months before. On April 18, 1861, important orders were being issued from the Navy Department. The Norfolk navy yard was known to be in danger. A special messenger was dispatched to Commodore Hiram Paulding with instructions to repair to Norfolk. The commandant of the Philadelphia navy yard a few hours later received telegraphic directions of great import. Lieutenant Maxwell Woodhull on the same date received his orders and also "private instructions." Within 48 hours, the *Keystone State*, "the fastest steamer out of this port," was chartered by Captain Dupont, manned with 6 officers, 50 seamen and 50 marines, armed with four howitzers, and dispatched (April 20) to Norfolk, Va., where she arrived "too late to participate in the destruction of the navy yard," but in time to tow the *Cumberland* out of danger and convey Commodore Paulding and his loyal officers and men to Washington for the defense of the capital.

On April 23, 1861, Lieutenant Stephen D. Trenchard was ordered to relieve Lieutenant Maxwell. Under his command the *Keystone State* left Washington on April 24, and during the next six weeks performed transport duty between Fortress Monroe and the New York yard. On June 3 the *Keystone State* was ordered to the Philadelphia navy yard. Seven days later she was purchased into the public service.

Commander G. H. Scott assumed command on July 19, 1861, and within a few hours the *Keystone State* left Philadelphia and proceeded to cruise in search of the C. S. S. *Sumter* in accordance with the Department's orders. But, though she had all the requisites necessary for a cruiser, "possessing great speed as the first requisite, and with sufficient force to dominate over any hostile cruiser known to be at sea," her search was in vain, and she returned to Philadelphia on October 25, 1861, having made but one capture.

Lieutenant C. H. B. Caldwell took charge of the vessel (October 26) during her stay in port until Commander William E. Le Roy's arrival on November 12, 1861. Then in three weeks the ship was again at sea. Sailing from Philadelphia on December 8, 1861, Commander Le Roy made his cruising ground in the vicinity of Bermuda, for the "interdiction of intercourse and traffic between Bermuda and the insurrectionary states," which station was maintained until the close of the month, when an epidemic of smallpox compelled him to return to port. By January, 1862, however, the *Keystone State* was again on the blockade, this time off Fernandina, Fla., with the South Atlantic blockading squadron, under the orders of Flag Officer S. F. Dupont. The British schooner *Mars* was captured on February 5. Then Commander Le Roy was ordered to cruise off Georgetown, S. C. For a month this station was maintained, during which two blockade runners were destroyed or captured. St. Simon's Island, Ga., was the next position assigned to the *Keystone State,* and then Dewees Inlet, north of Charleston. Three British blockade runners, the steamer *Elizabeth,* the schooner *Cora,* and the schooner *Sarah,* were intercepted between May 29 and June 20. In August, 1862, Commander Le Roy cruised off the coast of Georgia and captured the British schooner *Fanny* near St. Simon's Sound.

All this time the *Keystone State* was on the "outer blockade" and cruising continuously. On the morning of January 31, 1863, she was at anchor off the main entrance to the harbor of Charleston, S. C. This was the occasion upon which the Confederate ironclads *Palmetto State* and *Chicora* came out in the early morning "during the obscurity of a thick haze, unperceived by the squadron and commenced a raid upon the blockading fleet." The gunboat *Mercedita* was compelled to strike her colors almost immediately, having been rendered unmanageable by a shell

through her condenser. Then the rams turned upon the *Keystone State.* "Their fire was gallantly returned," reported Admiral Dupont, "but a shell exploding in the forehold of this vessel, she was set on fire. Commander Le Roy kept off until it was got under, when he steered again for one of the ironclads, ordered full steam, and determined to try to run her down. The guns had been trained and depressed for a plunging fire at the moment of collision and the ship had acquired a speed of 12 knots, when a shell or shot from the enemy passed through both steam chests, wholly disabling her boilers and rendering her powerless. Ten rifle shells struck the *Keystone State;* two burst on the quarter-deck, but most of them struck the hull, being near and below the water line."

"Our situation became critical," says Commander Le Roy in his description of the engagement. "There were 2 feet of water in the ship and leaking badly, water rising rapidly, the forehold on fire. Others of the squadron coming along, the ram that had injured us so much altered her course, and before our wheels entirely stopped we were enabled to get a hawser from the *Memphis* and were taken in tow." With 20 of her men killed and 20 more wounded, the *Keystone State* made the best of her way to Port Royal, whence she was ordered to Philadelphia for extensive repairs, sorely needed, as in her present condition she was utterly "unfit for outside blockading duty."

When Commander Edward Donaldson assumed command on October 3, 1863, the *Keystone State* was ordered to report to Rear Admiral S. P. Lee off Wilmington for duty with the North Atlantic blockading squadron. On November 5, 1863, the steamer *Margaret and Jessie* was brought to; on November 7 and January 10, 1864, two vessels slipped by and made their escape; and then it was the *Keystone State's* turn to run, for, on January 31, 1864, the U. S. S. *Sassacus* mistook her for a hostile vessel, crowding on all steam in chase, and actually firing several shots at her before her ship's number could be read. Returning to Beaufort, N. C., on March 5, Lieutenant James P. Robertson relieved Commander Donaldson in command on March 6, and was in turn succeeded by Commander Pierce Crosby (March 16, 1864).

Between March 24 and 26 the *Keystone State* sent a boat to participate in an expedition to Swansboro and Bear Creek, N. C., after which she again resumed her old station on the blockade off Wilmington to intercept the blockade runners coming from

Bermuda. On April 29, Commander A. G. Clary took command of the ship off Wilmington, but on May 26 Commander Crosby returned to the ship and began a brief but successful cruise. On May 30 the British steamer *Caledonia* was captured at sea; on June 5 the steamer *Siren* was intercepted off Beaufort; on July 2 the British steamer *Rouen* was made a prize. Then the ship began to fall off in her speed, owing to the want of extensive repairs. "The boilers are getting very bad," wrote Commander Crosby, "not trustworthy in chase or bad weather." On July 26 and 27 two vessels were chased, but both were lost, owing to the boilers giving out, though 62 bales of cotton, thrown overboard by one of the blockade runners, were picked up.

Yet the *Keystone State* still remained at sea. On August 24 she took the British steamer *Lilian,* and two weeks later the *Elsie.* Then a fortnight passed in repairs at Beaufort. On September 21, 1864, Commander Crosby was again cruising in the Gulf Stream and off the southern coast.

On October 30, 1864, Commander Henry Rolando relieved Commander Crosby in command. Clearing from Beaufort on October 31, the ship proceeded to the blockade duty assigned. But consecutive gales caused her to make heavy weather and start several leaks in her spar deck and upper works. "I sighted nothing," wrote Commander Rolando, "except our cruisers and a few sailing vessels," except on November 10, when a fast blockade runner was sighted but not overhauled. Then the *Keystone State* returned to Wilmington to participate in the two attacks upon Fort Fisher, as well as in the joint land and naval operations against the remaining Confederate positions in the Cape Fear River.

This was her last war service. On March 21, 1865, Commander Rolando brought the *Keystone State* to anchor off Baltimore. Four days later the ship was placed out of commission, and on September 15, 1865, she was sold at Washington, D. C., to M. O. Roberts for $54,000.

CORRECTION

Page 445 of the March-April number where appears the statement: "Later Captain Selfridge was ordered to the mouth of the Mississippi River, and she arrived in time to participate in the quasi-engagement with the Confederate ram *Manassas,*" should read, "Later Captain Selfridge was ordered to the mouth of the Mississippi River, where, some time previous, had occurred the quasi-engagement with the Confederate ram *Manassas.*"

ANTOINE JOSEPH CORBESIER

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ANTOINE JOSEPH CORBESIER

AN APPRECIATION

Graduates of the Naval Academy have always held in affectionate remembrance, and have never failed to pay proper tribute to, the faithfulness and efficiency of the old instructors and employees at Annapolis.

There have been many fine types among these men, and we are always delighted to grasp them by the hand whenever we return to our alma mater.

Professor Corbesier's record was one of complete loyalty to naval and military traditions. For many years he was my assistant as drill master in the Department of Ordnance, and I have never seen a finer example of attention to every duty. His success with midshipmen was insured by his never-failing enthusiasm and infinite patience.

The funeral services were held in the Naval Academy Chapel, and the interment took place in the Naval Academy Cemetery. All officers, and the regiment of midshipmen, attended as mourners to pay the last tribute to a man who had always shown in himself a good example of " virtue, honor, patriotism, and subordination."

U. S. NAVAL ACADEMY

ANNAPOLIS, MARYLAND

March 26, 1915

NAVAL ACADEMY ORDER NO. 60

The Superintendent has the painful duty of announcing the death of First Lieutenant Antoine Joseph Corbesier, U. S. Marine Corps, which occurred at the Naval Hospital, Annapolis, at 4.20 a. m., Friday, March 26.

Lieutenant Corbesier was born in Brussels, Belgium, January 22, 1837, and was appointed swordmaster at the U. S. Naval Academy in October, 1865, serving faithfully and efficiently for a period of 49 years.

He was commissioned a first lieutenant in the Marine Corps, March 4, 1913, by special Act of Congress.

Professor Corbesier was an interesting and conspicuous figure in the history of the Naval Academy for nearly half a century. Possessed of a stern though lovable nature, he won the high esteem and affection of all with whom he came in contact.

Every graduate of the Naval Academy on the active list of the navy, to-day, except the admiral of the navy, has been under the military instruction of Professor Corbesier, and his death will be mourned by thousands of men in all walks of life who have known him through their attendance at the Naval Academy.

The value of Professor Corbesier's services to the navy is incalculable. He was the author of the "Sword Exercise" and "Bayonet Exercise" as laid down in the Navy Drill Regulations, and his "Setting Up" drill was long the standard of the navy.

During all the years of his splendid service, Professor Corbesier showed the greatest possible interest in the development and instruction of midshipmen, and he never failed to win their sincere respect and affection. His manner and bearing were always military, his habits and his private character were exemplary and his influence was most powerful for good.

The deepest sympathy is extended to his family in their bereavement.

W. F. FULLAM,
Rear Admiral, U. S. Navy,
Superintendent.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE UNITED STATES NAVY IN MEXICO 1821–1914

By Louis N. Feipel

CHAPTER IV

War with Mexico—Operations on the West Coast, 1846–1848

While the occupation of Upper California was thus going on, our naval force on the west coast was also engaged in various operations in the region of Lower California. In July, 1846, the *Cyane,* Commander DuPont, having landed the detachment of Major Fremont at San Diego, was sent down on blockading duty to the main coast of Mexico. She arrived at San Blas on the 2d of September. Here a party was sent on shore under the command of Lieutenant Stephen C. Rowan, which spiked all the guns that could be found at the place, amounting to 24 in all, and varying in caliber from twelves to thirty-twos. They were not all, however, in serviceable condition. It was not the policy of the commander-in-chief at this time to take possession of any points on this distant part of the coast, as the force under his orders was insufficient for such a purpose, at least while Upper California required such constant attention. The duty of the ships was, therefore, confined to watching the ports and enforcing the blockade as strictly as possible. More active employment was occasionally found in hindering the military preparations of the Mexicans, and in destroying such means of defence as it was within the reach and capacity of a small naval force successfully to attack. The *Cyane,* therefore, kept to the northward, touching at Mazatlan, where the *Warren* was engaged in blockading, and thence running into the Gulf of California, making the ports of La Paz and Mulege.

From Mulege it was found that a Mexican gun-boat had lately sailed, going, it was supposed, across the Gulf to Guaymas.

Thither the *Cyane* followed, and anchored in the inner harbor on the 6th of October. A battalion of troops of the line, with field artillery, was posted in the town, and in connection with the national guard formed a body of 500 soldiers. Commander DuPont immediately sent a communication to the Mexican commander, informing him of the declaration of a general blockade, and of the lenient terms which had been granted to other places on condition of not taking an active part in the hostilities. At the same time, he demanded the surrender of the two gun-boats which were lying in the harbor. This being refused, the American commander sent another message, saying that he would be obliged to take them by force. From most commendable motives, too, he expressed his desire not to be compelled to fire upon the town; yet he informed the Mexican commander that resistance would oblige him to retaliate in that manner.

In the meantime, and before an attack could be made upon them, the Mexicans set fire to the gun-boats, and they were entirely consumed. A Mexican brig, however, was left unharmed, in the belief that she was in too strong a position to be in danger of being cut out. Being a lawful prize, and, if left, likely to be of service to the enemy in conveying military supplies, DuPont determined to cut her out. She was anchored in a cove formed by a long projecting point of land. She was hauled close in toward the houses, within pistol shot of them, with two streets opening upon her, one of which led down from the barracks where the troops were posted. These barracks were situated behind a mound of earth, so that the Mexicans might with reason have supposed that the brig was too well protected to be liable to an attack. Indeed, it would be necessary, should the brig be successfully carried, to tow her for some distance in front of this strong position before she could bear away from it.

The *Cyane* was hauled in as close as possible to the town, for it was apparent that, should the enemy be at all bold and active, the brig could be carried and brought out by the boats only under a well-directed and spirited fire from the ship. The party sent in was embarked in the launch and one of the cutters, and was under the command of Lieutenant G. W. Harrison, aided by three other officers. They rowed steadily in and succeeded in boarding the brig and cutting her chain cable, the ship meanwhile keeping up a heavy fire upon that part of the town where the

troops were stationed. The brig being now in our possession, and the Mexicans having offered no resistance thus far, Commander DuPont, wishing to do as little injury to the town as possible, ordered the firing from the ship to cease. Thereupon the enemy rushed forth and opened fire upon the brig and the boats. This compelled a reply, and the ship, brig and boats all poured in a fire upon the town that forced the troops back to cover.

During this time the boats and the brig had so far changed their position that they now came within the range of the ship's fire. This made a cessation of the firing again necessary, and, as before, the courage of the Mexicans revived, their troops once more rallying to the attack. A company of Indians also had managed to get around the cove, and took up a position from which they could add a cross-fire to that of the main attack. The American commander was thus again obliged to use the guns of the ship, although this involved considerable hazard to those in the brig and boats. This time the shells were thrown with particularly great rapidity and precision and, producing consternation by bursting, speedily silenced the fire from shore. In the meantime, the brig had been set on fire by the captors. Nevertheless, she was brought out and towed into a cove near by, where she was entirely consumed. The coolness and gallantry of Lieutenant Harrison and his companions elicited the highest praise from Commander DuPont.

Leaving the Gulf, the *Cyane* ran down to Mazatlan, where she relieved the *Warren* and was for some time employed in watching that port, which was then the most important on the entire west coast of North America. In consequence of the close blockade which was being maintained, the town was suffering considerably from a scarcity of provisions, and various small vessels were attempting to run up the Gulf in order to supply the place with flour. These vessels managed to keep near the shore, where, from the nature of the coast, a ship of war could not reach them. Large bodies of troops were also posted at Mazatlan, and with their artillery they could furnish efficient cover to the vessels as they ran along the coast. Such a traffic could only be broken up by attacks made in the boats of the ship, and much arduous service was performed by the officers and men in this manner. The parties in the boats succeeded on two occasions in cutting

off four small vessels from the harbor, and forced them through the breakers onto the beach, where they were deserted. On the second occasion, as the ship's boats were returning from their work, four boats, two of them launches, and having on board 60 soldiers, put out from the harbor for the purpose of intercepting the men of the *Cyane*. The *Cyane's* boats were her three smallest, and were under the command of Lieutenant Harrison. The ship was not in a position to cover them, but notwithstanding the odds, they gallantly formed in line and bore down upon the Mexicans. The encounter was sharp, the Mexicans for a time maintaining a vigorous fire; but they finally broke their order of battle, ran their boats on shore, and fled to the cover of the bushes. On both these occasions, the Mexicans were aided by artillery on the shore, while the guns of the *Cyane* could render no assistance to the parties in the boats.

The *Cyane* was very efficient in making captures while she was engaged in blockade duty at various points. She captured 23 vessels of all kinds, including brigs, brigantines, schooners and smaller craft, either Mexican, sailing under Mexican colors, or neutrals attempting to run the blockade.

When our naval forces left Monterey in the spring of 1847, as narrated before, the season of the year was not yet far enough advanced to send ships into the Gulf of California. Preparations were nevertheless made to move the whole of the available force in that direction as soon as it would be prudent to do so. The *Congress* was kept cruising to the southward, and indeed most of the active vessels were moving up and down the coast, looking out for privateers and rendering such services as were in their power. Toward the close of September, Captain Lavallette went into the Gulf with his own ship (the *Independence*) and the *Portsmouth,* and on the 16th of October the former sailed in company with the *Cyane* to join Commodore Shubrick off Cape San Lucas. This junction was made on the 29th, when Captain Lavallette reported the result of his successful attempt made on the town of Guaymas, nearly at the head of the Gulf.

Guaymas had a considerable force, and works of respectable extent; but Captain Lavallette took his frigate and the sloop within fair range of the enemy's guns, and planted two pieces of heavy artillery on a couple of islands that were favorably situated for that purpose. After a cannonading of three-quarters of an

hour, beginning at sunrise the next morning, a white flag was hoisted on shore. The enemy had evacuated the place, and the inhabitants were hastily leaving. Captain Lavallette caused all the batteries on the water-front to be blown up, and garrisoned the place. Commander Montgomery, in the *Portsmouth,* was left to look out for the port, while Captain Lavallette ran over to Loreto to meet the *Dale,* which vessel he expected to find at that place prior to joining Commodore Shubrick off Cape San Lucas.

In November, 1847, the *Dale,* Commander Thomas O. Selfridge, was sent to Guaymas to relieve the *Portsmouth,* the latter vessel thereupon joining the main squadron. The flag was now flying at La Paz; and in the month of November it was also hoisted at San José by the flagship. This was done at the earnest request of friendly citizens, in order that they might be protected from the insurrectionists, who were very active in Lower California at that time. Lieutenant Charles Heywood, with four passed midshipmen and 20 marines, was placed in command of this post. He was also furnished with a 9-pounder carronade and some firearms, to be loaned in an emergency to friendly Californians. He posted his force in an old mission-house situated in the higher portion of the town.

On the 8th of November, Commodore Shubrick left San José and stood over to the coast of Mexico with the *Independence,* the *Congress* and the *Cyane.* His destination was Mazatlan, and his object was the capture of that important city and the diversion of its commercial revenue into the treasury of the United States. Mazatlan contained at that time about 11,000 inhabitants, and was occupied by Colonel Telles with a force of from 900 to 1200 regular troops. It had been known to yield three millions of dollars revenue to the Mexican government in one year. It was within easy reach of reinforcements from states which had contributed no quota to the war, and it was known there that its occupation by our squadron was contemplated.

On the 10th of November, in the afternoon, the ships came in sight of the town. The position of each had been assigned and marked on a plan of the coast and harbor which had been furnished to the commanders. The wind being light, the commander-in-chief inquired if the ships could take their positions after dark, and being answered in the affirmative, directed them to proceed. The *Congress* led off in fine style to that bend in the coast outside

known as the old harbor, where, the shore being low, she could command some of the avenues leading from the town, and effectually cover the landing, should the surf permit that point to be selected. It was a hazardous anchorage, but an important position, and therefore boldly taken. The *Independence* stood for another slight bend in the peninsula on which Mazatlan is situated, and where a break in the coast range exposes to view, from the westward, the most important part of the town. This she brought to bear immediately under her guns. The *Cyane* kept on, to get her station in the new harbor, her light draft enabling her to get sufficiently close to the bar for her 8-inch guns to reach the wharf and cover the landing, should that point be selected. An English vessel of war was at anchor in the harbor, and the manner in which our ships took their positions and invested the town drew high encomiums from her commander and officers.

Early on the morning of the 11th, Mazatlan was summoned to surrender, Captain Lavallette, the second in command, bearing the communication from Commodore Shubrick. Colonel Telles, the military commandant, tore the summons up, with insolent threats. On the return of Captain Lavallette, orders were issued for an immediate landing. The height of the surf forbade the attempt being made outside, and the usual place of landing inside of the harbor was designated. The boats of the *Independence*, *Congress* and *Erie* (which last ship, under the command of Lieutenant James M. Watson, had anchored in the offing a day or two previous) were joined, on entering the harbor, by those of the *Cyane*, and this ship had her broadside sprung to cover the landing, if necessary. The boats entered the harbor in three lines, commanded by the officers of the respective ships, the whole under the direction of the commander-in-chief in person. A division of the *Congress*, under Lieutenant John T. Livingston, had charge of the artillery, which consisted of five pieces which had been captured in Upper California and mounted on board that ship. The men were on shore in a twinkling, and the companies formed while the artillery was landing. The whole force, about 600 strong, then marched through the town to the Cuartel, situated on a mound overlooking the surrounding country, on the walls of which the American flag was hoisted under a salute of 21 guns from the *Independence*.

Colonel Telles, with his whole force, had retreated on the approach of the Americans. No laurels were consequently reaped, and no blood was shed. The capture was, nevertheless, important. Prompt measures were at once taken for defending and holding the place, and a municipal government was soon established. Captain Lavallette was made Governor and was furnished with a garrison of seamen and marines. A commission, consisting of Commander DuPont, Lieutenant Chatard, Purser Price and Mr. Thomas Miller, arranged with the municipal Junta the terms of occupation. The ships moved into the harbor, the custom-house was opened and organized, and a tariff of duties, modified to suit the trade of the coast, was established. Purser H. W. Greene of the *Independence* appointed collectors, under whose judicious management, assisted by Purser Speiden of the *Congress,* more than a quarter of a million of dollars in duties was collected in five months.

The judicious arrangements which Commodore Shubrick made for the capture of this important point reflect great credit upon the capacity of that officer, and the efficiency and steadiness with which these arrangements were carried out are indicative of the good qualities of the respective commanders and of the officers and men under their orders. There can be no doubt that the skill and ability manifested in the disposition of the forces, in connection with the uniform success of the American arms over every portion of the wide field of this war, led the Mexican commander at Mazatlan to withdraw a body of troops which might have given serious trouble to the invaders, and might not have left them the satisfaction of having won a bloodless victory. As it was, commerce soon resumed its wonted activity, although trading with the interior continued to be interfered with by the troops of Colonel Telles, who still occupied a position a few miles from the city.

On the 20th of November, two parties—one on land, consisting of 94 sailors under Lieutenant Selden, and the other in boats, consisting of 62 men under Lieutenant Rowan—were sent to disperse a body of the enemy posted about ten miles out. The attack was begun at daylight and was warmly resisted by the enemy. But it was soon completely successful, the Mexicans breaking in confusion before the impetuous charge of the seamen, and throwing away their arms in their flight. The Americans

lost one man killed, and three officers and 17 men wounded, the loss of the enemy being seven killed, with 25 or 30 wounded. These sorties drove the Mexicans further back and left the roads more free. For some time, however, a large garrison was maintained on shore, and until the close of the war a strong naval force continued at anchor in the bay. And in consequence of the large force required at this point, and the necessity of sending reinforcements to Lower California, Commodore Shubrick was unable to take possession of the other Mexican ports farther to the south, as had been contemplated in his original plan.

Events occurring in the meantime in Sonora and Lower California recall our attention to those provinces. It has been stated that the *Dale* (Commander Selfridge) was ordered to Guaymas, in the province of Sonora, to retain possession of that port. On his way thither this officer learned that insurrectionary movements were on foot at Mulege, on the east coast of Lower California. Troops and munitions of war were conveyed from Mexico, across the Gulf, to this place. When the *Dale* arrived at Mulege, it was found that the region was in possession of Mexican troops to the number of 150 or more, headed by a chief called Pineda. The broadside of the ship was sprung so as to command the shores of a creek, up which Lieutenant T. A. M. Craven proceeded with four boats and 50 men to cut out a schooner. This was done without resistance, though large numbers of Mexicans were in sight. The next day the same officer, with the marines and 50 sailors, landed on the right bank of the creek and scoured the valley to the distance of nearly three miles. They were frequently assailed by the enemy in ambush, but they steadily advanced, driving the latter before them. At the same time, the battery of the ship kept up a fire of round shot and shell, which aided greatly in forcing the Mexicans back. They abandoned the village and retreated up the valley to a place where, through fear of being led into an ambush, it was not thought prudent to follow. The troops then returned to the ship without the loss of a man, and with but two slightly wounded.

A small schooner was hired and placed under the command of Lieutenant Craven for the purpose of cruising in this part of the Gulf and preventing intercourse with the main shore of Mexico. The *Dale* thereupon proceeded to Guaymas, where she arrived on the 8th of November, relieving the *Portsmouth* from the duty of

guarding that port. The enemy's forces in this vicinity had increased to a considerable amount, being probably not less than a thousand men. Commander Selfridge had not enough men to garrison the town, but the flag was kept flying on an island under the guns of his ship. The enemy sought in large force to gain a lodgment in the town, but the shot and shell from the ship rendered this position not very tenable.

On the 17th of November, Commander Selfridge, supposing that there were no more of the enemy in the immediate neighborhood, landed at the head of a party of 65 marines and seamen. They had not proceeded far when they were assailed by a volley of musketry from a house. A ball wounded Commander Selfridge severely in the foot, obliging him to relinquish the command to Lieutenant W. T. Smith and to return to the ship. Lieutenant Smith now found himself engaged with about 300 of the enemy, who met him with a brisk fire and some show of resistance. The fire of the little force of marines and seamen was, however, delivered with such rapidity and precision that the Mexicans soon began to retreat precipitately. The fire from the ship was also opened, and began to be felt. The enemy was now in hopeless confusion, and evacuated the town in all possible haste. But the American detachment was not sufficient to follow them up with effect. In this creditable action the Americans suffered no injury, except the wound of the commander, while the loss of the enemy must have been not less than 30 killed and wounded. This check to the Mexicans was serviceable because it was quite important that the place should be held at all hazards.

It will now be in order to return to the state of affairs in the province of Lower California. The Mexicans who had landed at Mulege, and whom Commander Selfridge had so gallantly driven into the interior, passed through the country, exciting hostility to the American rule and drawing the disaffected into their ranks. The majority of the people were without doubt friendly to the provisional government established by the military power of the United States, and but comparatively few joined the standard of revolt. On the 16th of November, a body of Mexicans attacked the post established at La Paz. This post was held and most handsomely defended by Lieut. Colonel Burton, with a detachment of the regiment of New York Volunteers. And as this affair belongs properly to the history of army operations,

it need not be described in this work. But on the 19th of November, a large body of the enemy came within a league of the post established at San José, which, it will be remembered, was occupied by Lieutenant Heywood, with four officers and 20 marines. He had also organized and armed about 20 volunteers. The position occupied by them consisted of two houses, one an old mission-house, which had to be somewhat strengthened and repaired to make it defensible, and the other a private house so closely adjoining that it was necessary to occupy it lest it should fall into the hands of the enemy. In the last-named, Passed Midshipman McLanahan was stationed, with 12 volunteers. At the mission-house, a 9-pounder was mounted, and loop-holes had been left for musketry.

On the morning of the 19th, an advance guard of the enemy approached and demanded a surrender, which, of course, was refused. The main body of the enemy took up a position on an eminence about a quarter of a mile distant. It consisted of 150 mounted men. They began the attack late in the day by a fire from a 6-pounder, which ceased at dark, having done but little damage. About 10 o'clock at night, the whole body of the enemy began an attack upon the front and rear of both houses. Their fire was vigorous, but was returned as vigorously by the little garrison. The defence was so effectual that the enemy were glad to cover themselves with the neighboring buildings, and thus the combat was continued throughout the night. By morning the enemy had returned to their camp, and the ensuing day was passed quietly. But as night closed in, the Mexicans were again in motion. They now determined to undertake the capture of the mission-house by assault. This was a bold plan to be formed against so determined a garrison. In executing the movement, a strong party rushed up toward the front of the house with the intention of forcing their way in and capturing the gun; but a destructive discharge of musketry brought down their leader and several of their number, whereupon they broke and fled. This repulse in front intimidated the party in the rear, who were approaching with ladders to scale the walls, and they were thus easily driven back.

The next morning, a whaling vessel came in sight and anchored off the town. The Mexicans probably took her for a ship of war, for the whole body soon moved off. They had lost at least eight

killed and more than that number wounded; while of the garrison, but one was seriously wounded, and two only slightly. As soon as the report of these hostilities reached Commodore Shubrick, he despatched the store-ship *Southampton* to the aid of Lieutenant Heywood. The *Portsmouth* followed as soon as possible, and the *Cyane* was sent to La Paz with aid and supplies for Lieut. Colonel Burton.

On the 12th of January, 1848, San Blas, a seaport town, situated to the south of Mazatlan, was captured by a small force of Americans under the orders of Lieut. Commandant Theodorus Bailey, who was maintaining the blockade of that port in the store-ship *Lexington*. The party landed under the immediate command of Lieutenant Frederick Chatard, and brought off two pieces of artillery from the fort and a fine boat belonging to the custom-house. No opposition was met with. Still it was not deemed advisable to hoist the flag, as no sufficient force could be left on shore to defend it. Lieutenant Chatard also landed a small party at Manzanillo and spiked three large guns. Mexico now had not a single gun mounted on the entire west coast, except at Acapulco.

In the province of Sonora, the enemy still continued to hover about Guaymas. A detachment having established itself at Cochori, about nine miles from Guaymas, on the coast, Lieutenant E. M. Yard, then commanding the *Dale*, determined to dislodge it. A party of seamen and marines was detailed from the ship for that purpose and placed under the command of Lieutenant Craven. After proceeding four miles in boats, they landed, and advanced cautiously to surprise the enemy. In this they were successful. The house where the enemy was posted was almost surrounded before the Americans were discovered. Some firing ensued, but the enemy soon yielded. As the attack was made in the night, some of the enemy escaped; but the commander and six soldiers were taken prisoners, and five were left dead upon the field. The assailing party suffered no loss.

In the early part of the year 1848, also, San José again became the center of active military operations. On the 22d of January, a small detachment of Lieutenant Heywood's command, consisting of Passed Midshipmen A. F. Warley and J. M. Duncan, and six men, was captured on the beach by a large body of the enemy's cavalry. This was a serious loss to the little garrison. The

Southampton, having furnished all possible aid to Lieutenant Heywood, was sent to La Paz, with orders for the *Cyane* to take her place at San José. This was a very opportune change, but before it was fully effected hostilities were renewed around the devoted mission-house, although the *Cyane* arrived in time to take part in them. The enemy, despairing of carrying a post so well defended as La Paz, had concentrated his forces, to the number of three or four hundred men, around the feebler position held at San José. The defence of this position rested with a garrison of 27 marines, 10 effective seamen, and about 20 California volunteers. The town was deserted by its inhabitants, and about 50 women and children sought protection in the imperfect fort and were supported from its scanty supplies.

In the latter part of January, the Mexicans appeared in force. On the 4th of February, they drew their lines quite closely around the fort and fired upon all who showed themselves. On the 6th, a sortie was made by Lieutenant Heywood with 25 men, which succeeded in dislodging a strong party posted at the lower end of the street. On the 7th, another bold and successful sortie was made, attended, however, with the loss of one man. Notwithstanding these sorties, the enemy gradually hemmed the garrison in more closely. Their former experience had taught them not to risk an assault, and their policy now seemed to be to reduce the garrison by a regular investment and siege. By the 10th, they had complete possession of the town. They occupied a church and other commanding buildings within musket-shot, from which they kept up an almost incessant fire during the remainder of the siege. It was seldom that the besieged were able to find an opportunity to fire at the besiegers with effect. On the 11th, the firing was continued with great vigor; and during this day the garrison suffered the loss of Passed Midshipman McLanahan, who was wounded in the neck and survived but two hours.

The morning of the 12th revealed a new source of annoyance for the Americans. The enemy had erected a breastwork, from which they commanded the watering-place of the garrison. Nothing daunted, however, the men went vigorously to work digging for water within the post, and this against great difficulties, as they did not dare to blast the rock for fear of drawing the fire of the enemy. On the 14th, the supply of water began to run low, and still a continual fire was poured in on the heroic

band. But on this day relief came. In the afternoon the *Cyane* hove in sight and soon came up, anchoring off the town. The interest of the fight now turned in that direction. Commander DuPont, of the *Cyane*, knowing that the Mexicans were there in great force, and wisely judging that they had full possession of the space between the beach and the mission-house, deemed it too hazardous to attempt relieving his beleaguered comrades by night, except in the case of an emergency. To those on board the ship the night attack was unknown, as the report of small-arms could not reach that distance, and Lieutenant Heywood refrained from using artillery lest he should alarm his friends and so induce them to land at night.

But when day dawned, the boats of the *Cyane* were seen moving toward the shore. They contained 102 officers and men, headed by Commander DuPont. The enemy soon showed himself in full force in front, and the contest began. As the Mexicans possessed the advantage of cover along the road, they were able to keep up an annoying flank and rear fire upon the advancing Americans. Still the latter moved steadily on, driving their opponents back at every point, or giving them volleys of musketry to the right and left, as occasion required. The Mexicans engaged with great vigor, and continued their fire throughout with steadiness. It would also have been quite destructive, had they not generally fired too high. Step by step the ground was gained and progress achieved, as the compact little column advanced with unconquerable bravery. It required the best exertions of the officers to restrain the impetuosity of the seamen, who were eager to come to close quarters, a movement which would have lost them the advantages gained by their unity and steadiness of action.

The progress of the battle could be seen quite plainly from both the ship and the fort, and naturally excited great interest among the observers at both those points. Those in the ship were unable to render any assistance with their long guns, as it was impossible to distinguish friend from foe. But the garrison could not curb their impatience, and soon sallied forth to effect a junction with their companions. A party of the enemy was still firing upon the fort, but the charge led by Lieutenant Heywood drove them from the street they occupied, and opened the way for the union of the two detachments. Just previous to the junction, the enemy made

a final stand and sought by great exertion to maintain their ground. But it was all in vain. The shout of victory was raised by the Americans just as Lieutenant Heywood joined the party of his friends. It surely borders on the miraculous that this march was made under such a fire, and that this victory should be gained by the Americans over treble their own number, without the loss of a single life and with only four slightly wounded. The loss of the enemy could not be ascertained with any exactness, but there were at least 13 killed. They also lost, in their long attack upon the post, at least 15 killed and many wounded. The casualties to Lieutenant Heywood's command were three killed and four slightly wounded. The coolness, perseverance and indomitable resolution displayed in this long defence against such superior numbers cannot but draw upon the actors especial notice and renown, and place it among the many memorable achievements of the war.

The organization of the insurrection was nearly broken up after this repulse. Though the chief, Pineda, with a considerable force, still remained in the vicinity, the presence of a ship of war operated as an effectual check upon any further attack. In the month of March, indeed, the Americans assumed the offensive, and by several sudden attacks, with comparatively small parties, drove the enemy further and further up the country. On the night of the 15th of that month, a detachment from the garrison at La Paz, under the command of Captain Steele of the New York regiment, made a forced march and came unexpectedly upon the enemy's camp at San Antonio. The surprise was complete and the conflict short. It ended in the discomfiture of the Mexicans and the rescue of the Americans who had been taken prisoners, as already mentioned, on the 22d of the preceding January. Colonel Burton and Commander DuPont kept up a system of short and rapid expeditions in various directions, wherever an enemy showed himself, so that by the close of April the forces of the Mexicans were wholly dispersed, their principal chiefs taken prisoner, and the province of Lower California rendered completely tranquil. On the 20th of April, a detachment of 100 men from the volunteer regiment in Upper California arrived at San José, and Lieutenant Heywood and his command returned to their own quarters on shipboard.

At Guaymas, where the *Dale* still remained, the officers and men were continually occupied in maintaining the blockade and in watching a great extent of coast in order to prevent the sending of military supplies or assistance across to Lower California. Their vigilance, together with occasional skirmishes, kept the enemy at a distance, and reduced him to defensive operations. Finally, on the receipt of the information of a provisional suspension of hostilities on the part of the main army in Mexico, Commodore Shubrick entered into a similar arrangement and withdrew the garrison from Mazatlan, leaving a few men to guard the works until the establishment of a definitive treaty of peace. Until the close of the war, therefore, the duty of the naval force was confined to the maintenance of the positions already held.

The first positive information relating to rumors of peace reached Mazatlan in March, 1848; and on the last day of that month, the official notification of the armistice was promulgated in the port. On the 8th of May, Lieutenant Henry Augustus Wise, attached to the *Independence,* was ordered to prepare for a journey to the City of Mexico as bearer of despatches, and to obtain satisfactory information of the ratification of the treaty of peace. Departing from the port of San Blas, Lieutenant Wise, in company with a Mexican officer, reached Querétaro on the 20th of May. There he learned that the treaty had already passed the Mexican Chamber of Deputies, and only awaited the action of the Senate to become a law. The next day he arrived in the City of Mexico and delivered his despatches. On the 30th of May, the final signatures were affixed to the treaty, and soon after midnight of the same day, Lieutenant Wise, with a copy of the document in his pocket, set out on the return journey to the Pacific Ocean. He reached Mazatlan safely, having travelled nearly 2500 miles during the round trip, and mostly on horseback. Mazatlan was at once evacuated by our naval forces, and in July, 1848, Commodore Shubrick sailed for home in the *Independence,* by way of the Sandwich Islands, having been relieved of the command of the Pacific squadron by Commodore Thomas Ap Catesby Jones, in the *Ohio.*

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AN APPLICATION OF THE LE DUC BALLISTIC FORMULA

By LIEUTENANT G. L. SCHUYLER, U. S. Navy

1. The Le Duc ballistic formula was discussed in the PROCEEDINGS in whole No. 138, by the late Professor Alger, and in whole No. 143, by Mr. G. W. Patterson. It calculates velocities and pressures in guns. Taking the notation of Mr. Patterson's article, we have for our naval guns:

Letter	Unit	Meaning
$\overline{w}$	Lbs.	Weight of smokeless powder in charge.
p	Lbs.	Weight of projectile.
Δ	....	Density of loading $= \frac{27.68\,\overline{w}}{S}$.
S	Cu. in.	Chamber capacity.
β	....	A powder constant (largest for slow powders)
v	F.-s.	Muzzle velocity.
u	Ft.	Travel of projectile in bore.
A	Sq. in.	Cross-section of bore.
g	F.-s. s.	Acceleration of gravity (32.155 at N. P. G.).
δ	....	Specific gravity of powder.
P	Tons, sq. in.	Effective pressure on base of projectile.

$$v = \frac{au}{b+u}, \tag{I}$$

$$a = 6823\,\Delta^{\frac{1}{12}}\left(\frac{\overline{w}}{p}\right)^{\frac{1}{2}}, \tag{II}$$

$$b = \beta\left(1 - \frac{\Delta}{\delta}\right)\left(\frac{S}{p}\right)^{\frac{2}{3}}, \tag{III}$$

$$P = \frac{a^2 \times b \times p \times u}{2240 \times g \times A \times (b+u)^3}. \tag{IV}$$

The values of the constant in (II) and the exponent in (III) are due to Mr. Patterson. He also gives the relation that in our powder δ is equal to

$$\frac{12.3728 - .132\,(\text{per cent total volatiles})}{7.4}$$

and states that pressure gauges usually read $1.12P$.

2. The commonest use of such formulæ is to see how a new powder being proved suits the gun. To do this, we take the charge that gives service velocity and compute a pressure curve (using the factor 1.12), and plotting this together with the strength curve we can see how the factor of safety varies along the bore, and whether it is everywhere above its prescribed minimum. The maximum pressure computed from weight of charge and the velocity will rarely agree perfectly with the gauges. How to get the most probable curve is then the question. Multiplying all ordinates of the curve by the factor which would make the computed maximum pressure agree with the gauge pressure is not permissible, for this would change the area of the curve, and the pressure curve's area is fixed by the muzzle energy.

3. The purpose of this note is to describe a simple way of forcing a curve that will check up with the observed gauge pressures without violating the formula. We work from charge and observed pressure instead of from charge and velocity.

In Professor Alger's article we see that the maximum pressure comes where $u = \frac{b}{2}$, so that (IV) becomes

$$P = \frac{4}{27} \times \frac{a^2 \times p}{2240 \times g \times A \times b}. \qquad (V)$$

Introducing the factor 1.12, which represents an average value, and transposing, we have

$$b = \frac{4}{27} \times \frac{p \times 1.12\, a^2}{2240 \times g \times A \times P \max\ (\text{gauge})}. \qquad (VI)$$

We can then substitute the value of a from (II), and replace Δ by its equivalent $\frac{27.68\,\overline{w}}{S}$ at the same time,

$$b = \frac{4}{27} \times \frac{1.12 \times \overline{6823}^2 \times \overline{27.68}^{\frac{1}{6}} \times \overline{w}^{\frac{1}{6}}\,\overline{w}}{2240 \times g \times A \times S^{\frac{1}{6}} \times P \max\ (\text{gauge})}, \qquad (VII)$$

so that

$$b = \frac{Q\,\overline{w}^{\frac{7}{6}}}{P \max\ (\text{gauge})}, \qquad (VIII)$$

where $Q = \left[\frac{4}{27} \times \frac{1.12}{2240} \times \frac{6823^2}{32.155} \times \frac{\overline{27.68}^{\frac{1}{6}}}{S^{\frac{1}{6}}}\right]$, which is different for each gun; and, from (IV),

$$P \max\ (\text{gauge}) = \frac{R \times u}{(b+u)^3}. \qquad (IX)$$

where R is a constant for a whole pressure curve, and of such value that it brings a pressure which is in agreement with the gauge pressure when $u = \frac{b}{2}$.

As a result we can tabulate log Q for all service guns, and use a printed form like the following:

log $\bar{w}$=.....	$\bar{w}$=.....	Gun.....
$\frac{1}{6}$ log $\bar{w}$=.....		Powder .....
Colog	P max (gauge).....	Date.....
Log Q.....		
log b.....	b=.....	
	$\frac{b}{2}$ =.....	

$$3\frac{b}{2} = \ldots\ldots$$

$$R = \frac{P \text{ max (gauge)} \times \left(\frac{3b}{2}\right)^3}{\frac{b}{2}} = \ldots\ldots \qquad P_{u_N} = \frac{R \times u_N}{(b+u_N)}.$$

u_1.....	u_2.....	u_3.....	u_4.....
b.....	b.....	b.....	b.....
$b+u_1$.....	$b+u_2$.....	$b+u_3$.....	$b+u_4$ .....
P_1.....	P_2	P_3.....	P_4.....

It is seen that b is obtained in three references to the tables and the other steps are done most conveniently on the slide rule or omnimeter. The first point can be obtained with practice in a little over two minutes from starting to write down the pressure and weight of charge; the other points follow much more rapidly, once b and R have been obtained for the first. Nothing has been changed in the formula in this application; it is merely one way of arranging the work to get a special result with rapidity.

DISCUSSION

A New System of Sound Signals in Fog

(See No. 155)

Lieutenant Earle Farwell, N. Y. N. M.—The article by Lieut. Marquart called to mind the paper presented by Captain Rust on Safety at Sea (September-October, 1914, Proceedings, Whole No. 153, page 1417). Both writers recognize that the principal cause of collisions in fog lies in the attempt of the vessels to avoid each other, and they assume that the present rules for preventing collisions are inadequate, and propose additions to these rules.

As a member of the Admiralty Bar of New York, having personal knowledge of a number of fog collision cases, and being familiar with many others through the reports of the trials, I have found that in practically every case a contributing, if not the sole, cause of collisions is excessive speed on the part of one or both of the vessels, and consequent inability to stop headway in sufficient season to avoid collision upon discovering the other vessel. It is in the prevention of this excessive speed that safety at sea lies, and anything that tends to encourage excessive speed is dangerous.

Both suggestions apparently recognize this danger, but in the writer's opinion the proposed modifications would tend to increase rather than decrease the danger from this source.

1. Both schemes attempt by means of signals (one by radio, the other by whistle) to indicate a vessel's course and speed. Both impliedly permit of vessels running at arbitrary speeds. No fixed rate of speed can be laid down as a limit, without grave danger of exceeding the "moderate speed" now required. Moderate speed is such speed that each vessel can stop her headway within her share of water included in the radius of visibility, and is dependent primarily upon the density of fog, and secondarily upon the maneuvering abilities of the vessel.

In litigation, arising as a result of a collision under the proposed rules, the defence would always be "I signalled my speed, and therefore I was entitled to proceed at that rate," irrespective of whether such speed was moderate or not.

2. Both proposed systems of signaling are complex, requiring four to six separate signals. Sound waves in fog are erratic, and the probability of misreading a complex sound signal is very great. As for radio signals, only passenger vessels are required to be equipped with radio.

Finally, it is in trying to avoid one another in fog that ships come into collision, instead of stopping the engines and then proceeding at moderate speed. The fault lies in erroneously assuming that the other vessel is going

to proceed upon a certain course and at a certain speed. The proposed changes not only encourage the assuming of the other vessel's speed and course, but almost compel it, and, with such great chances for error through ignorance or inattention, it would seem that the probability of collision would be increased instead of diminished.

If vessels proceed at moderate speed, within the definition of that term, collisions in fog would practically be eliminated as dangers of the sea. Safety lies in the strict enforcement of the present rules, and not in additional legislation.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Annual Dues

The annual dues for 1915 became payable on January 1, 1915. There is no change in dues on account of bi-monthly publication. It is suggested that dues be paid in lump sums covering a period of two to five years; this method of payment has advantages for members as well as for the Institute and is practiced by a number of members, both regular and associate. Response to this notice will save the Institute a considerable sum in stationery and postage.

Special Notice

It is believed that the scope of usefulness of the PROCEEDINGS to members of the Institute can be increased and all members are invited to assist in this work. Should any topic occur to you on which you think an article could well be written, or on which you would like to read one, send such topic to the Secretary and Treasurer, together with such explanation or comment as may appear desirable in order that the intent of the suggestion may be clearly understood. The Institute is desirous of obtaining good "sea yarns" for publication. It is hoped that anyone who can spin such a yarn will submit it.

References

Attention is invited to the following articles which have appeared in the pages of the PROCEEDINGS during the past two years; they treat of subjects which closely concern Naval War College work; a perusal of them should prove profitable:

1913

Trained Initiative and Unity of Action: The True Bases of Military Efficiency. By Lieutenant Commander D. W. Knox, U. S. N.; page 41, Whole No. 145, March, 1913.

Logistics: Its Bearing on the Art of War. By Commander C. T. Vogelgesang, U. S. N.; page 63, Whole No. 145, March, 1913.

Column as a Battle Formation. By Lieut. Commander D. W. Knox, U. S. N.; page 949, Whole No. 147, September, 1913.

The Naval War College, the General Board and the Office of Naval Intelligence. By Commander W. S. Crosley, U. S. N.; page 965, Whole No. 147, September, 1913.

Scouting and Screening Operations. By Lieut. Commander W. S. Pye, U. S. N.; page 1139, Whole No. 147, September, 1913.

Organization of the Fleet for War. By Lieutenant R. E. Ingersoll, U. S. N.; page 1739, Whole No. 148, December, 1913.

1914

War and Policy. By Captain J. S. McKean, U. S. N.; page 1, Whole No. 149, June, 1914.

Moral Training in Preparation for War. By Charles M. Bakewell; page 157, Whole No. 149, January, 1914.

The Great Lesson from Nelson for To-day. By Lieut. Commander D. W. Knox, U. S. N., P. E., page 295, Whole No. 150.

Naval Policy as it Relates to the Shore Establishment and the Maintenance of the Fleet. By Captain John Hood, U. S. N., H. M., 1914; page 319, Whole No. 150, March, 1914.

Details of Navy Department Administration: Navy Department Policies. By Lieut. Commander N. L. Jones, U. S. N.; page 377, Whole No. 150, March, 1914.

Military Preparedness. By Naval Constructor Richard Gatewood, U. S. N., H. M., 1914; page 631, Whole No. 151, May, 1914.

What Should be the Relations Between Battle and Reserve Fleets. By Captain W. S. Sims, U. S. N.; page 727, Whole No. 151, May, 1914.

Old Principles and Modern Applications. By Dudley W. Knox, U. S. N., H. M., 1914; page 1009, Whole No. 152, July, 1914.

The Battle of the Sea of Japan: Translation Japanese General Staff Report. By Captain W. T. Hoadley, U. S. Marine Corps; page 961, Whole No. 152, July, 1914.

Some Foreign and Other Views of War and the Study and Conduct of War. By Captain Albert Gleaves, U. S. N.; page 1301, Whole No. 153, September, 1914.

Strategic Problems and Their Solution. By Captain R. von Labres, I. G. N. Translated by Surgeon J. F. Leys, U. S. N.; page 1409, Whole No. 153, September, 1914.

Bureau of Information

The Institute offers its services as a "Bureau of Information" on professional questions and will endeavor to obtain replies from the best qualified sources. Those "Questions and Answers" which are suitable for purposes of general information, will appear in the PROCEEDINGS. It is suggested that knotty questions which come up in professional examinations for promotion may well be submitted to this department.

Membership

Since March 16, 1915, 40 regular, 9 associate members and 1 life member have joined the Institute; 3 members have resigned. The following members have died:

Captain W. McC. Little, U. S. N.
Mr. James Woodall.
Lieut. Commander W. F. Bricker, U. S. N.
Captain George Wood Logan, U. S. N.

The need for more members continues; bi-monthly publication should make the PROCEEDINGS more than ever valuable and necessary in keeping up with the naval profession; all members are asked to help in increasing the membership.

Notice

Whole Nos. 145 and 149 of the PROCEEDINGS (March, 1913, and Jan.-Feb., 1914) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

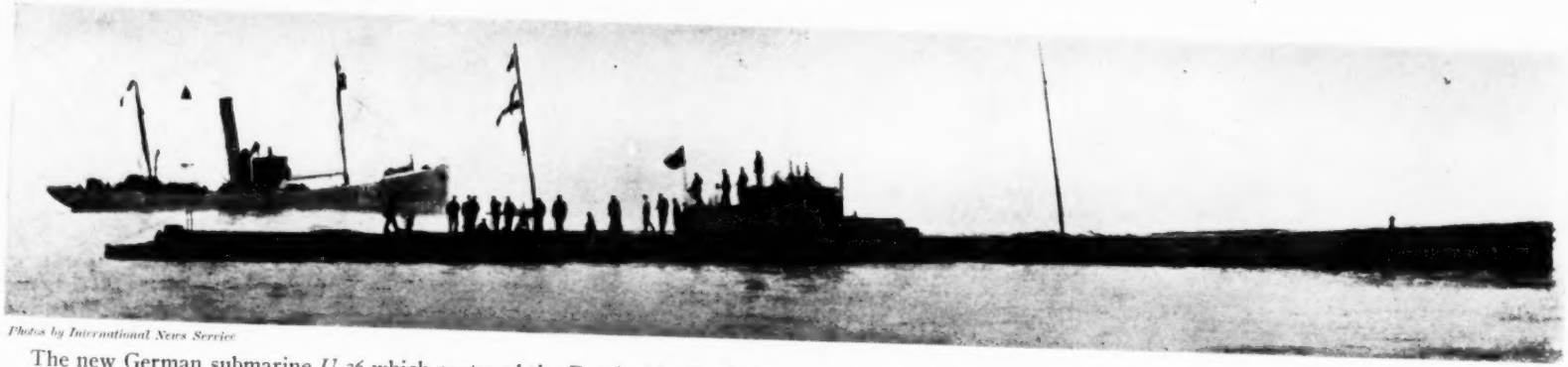
Address of Members

Members, especially those on the retired list, and civilians are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

ANNAPOLIS, MD., MAY 16, 1915.



Photos by International News Service

The new German submarine *U 36* which captured the Dutch ship *Zandstroom*, taking her into Zeebrugge, showing the undersea fighter's great length as compared with her tender lying off the Dutch coast

PROFESSIONAL NOTES

Prepared by LIEUTENANT C. C. GILL, U. S. Navy

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NAVAL POWERS

ARGENTINE REPUBLIC

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	27,940	22.5	12 12-in., 12 6-in., 16 4-in.	Fore River Co.	Completed
Moreno.....	27,940	22.5	same	New York Co.	Completed

NOTE.—Argentine has four destroyers, displacement 950 tons, contracted for (two built at Nantes and two at Bordeaux), launched in 1911 but not yet turned over to the government. Also four additional destroyers of about 950 tons to replace those sold to Greece, building at Krupp's Germania Works. (It is presumed that these destroyers have been taken over by France and Germany respectively, as war measures.)

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Prinz Eugen..	20,010	20	12 12-in., 12 5.9-in., 18 12-pdr.	Trieste	Commissioned
Szent Istvan..	20,010	20	same	Fiume	Launched Jan. 17, 1914
Ersatz Mon'ch	24,500	22½	10 14-in.	Trieste	To be laid down, 1914
" Budapest	24,500	22½	same	"	" " " " 1914
" Wien....	24,500	22½	same	Fiume	" " " " 1914
" Hapsburg	24,500	22½	same	Trieste	" " " " 1915
Small Cruisers					
Saida.....	3,454	27	9 4.1-in., 2 6-pdrs.	Montalcone	Trials Apr., 1914
Helgoland	3,454	27	same	Fiume	Launched Nov. 23, 1912
Novara.....	3,454	27	same	"	" Feb. 15, 1913

NOTE.—Three destroyers launched in 1913, displacement 787 tons, nearing completion. Two submarines, displacement 550 tons, and three of 860 tons, contracted for in 1912 are to be built by Krupp Co. There are also 27 torpedo boats of 250 tons displacement in various stages of construction. In lieu of definite information regarding progress in ship construction since outbreak of war conjectures may be based on dates in column headed "Remarks."

CHINA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Light cruisers					
Fei-Hung	2,600	22½	2 6-in., 4 4-in., 2 3-in., 6 3-pdr.	N. Y. Ship Bldg. Co.	Sold to Greece
.....	4,800	27	.....	Montalcone	Ordered Nov., 1913
.....	1,800	24	.....	"	Contracted for Sept., 1913
.....	1,800	24	.....	"	same
.....	1,800	24	.....	"	same

NOTE.—Four destroyers, displacement 400 tons, are building, one at Trieste and three at Schichau. The three Schichau boats have been delivered.

DENMARK

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Niels Juel.....	3,675	16	2 9.4-in., 4 5.9-in.	Copenhagen	Laid down Sept., 1913

NOTE.—Three destroyers are under construction at Copenhagen and three submarines, displacement 200 tons, are being built by Whitehead Co. (The submarines have probably been taken over by England.)

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
France.....	23,092	20	12 12-in., 22 5.5-in.	St. Nazaire	Commissioned
Paris.....	23,092	20	same	La Seyne	"
Bretagne.....	23,172	20	10 13.4-in., 22 5.5-in.	Brest	Launched April 21, 1913
Provence.....	23,172	20	same	Lorient	" April 20, 1913
Lorraine.....	23,600	20	same	St. Nazaire	" Sept. 30, 1913
Languedoc....	24,828	21.5	12 13.4-in., 24 5.5-in.	La Seyne	Laid down April 28, 1913
Normandie....	24,828	21.5	same	St. Nazaire	" July 5, 1913
Flandres.....	24,828	21.5	same	Brest	" Oct. 10, 1913
Gascogne.....	24,828	21.5	same	Lorient	" Oct. 1, 1913
Bearn.....	24,828	21.5	same	La Seyne	Contract Jan. 7, 1914

NOTE.—There are approximately six destroyers and 23 submarines under construction.

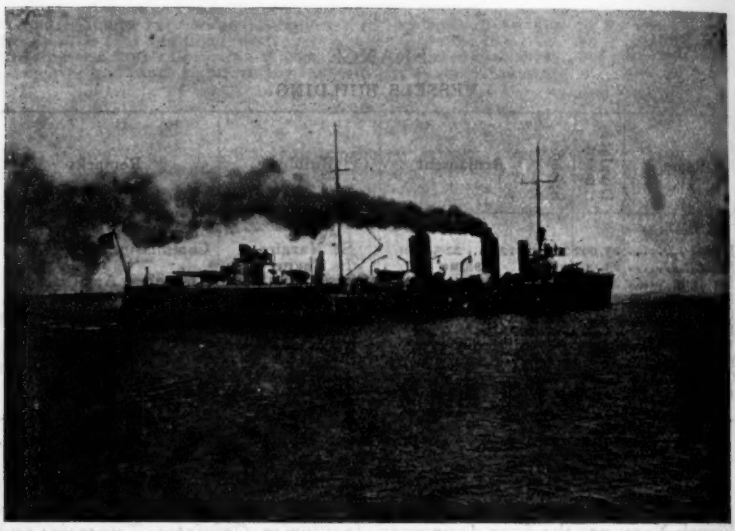
THE LATEST FRENCH DESTROYERS.—Among the latest additions to the French Navy are the four destroyers *Aventurier, Opiniatre, Temeraire* and *Intrepide*, which are the largest vessels of their type now under the French flag. All of these destroyers were built and engined by the "Britany yard" at Nantes. Their main particulars are: Length overall, 283 feet; beam, 28.32 feet; depth, 17 feet; draft, at the stern, 10 feet; displacement, 1100 tons.

The type of hull is the same as adopted in the previous destroyers *Voltigeur, Fourche*, etc., which have been illustrated and described in previous issues of this journal. This type of design, however, has proved very efficient, allowing the propellers to give their maximum efficiency even in bad weather. Their seaworthiness has been amply proved in actual service during the winter months.

The engines consist of two Rateau turbines, each driving a propeller 7 feet 3 inches in diameter and 6 feet 9 inches pitch, working at 650 revolutions per minute. The total horse-power developed is about 20,000, and it is reported that speeds of 32 knots were obtained on the measured mile trials. Steam is supplied by four water-tube boilers, using coal as fuel, and a fifth fired with oil fuel. The capacity of the coal bunkers is 12,362 cubic feet and of the oil tanks 3179 cubic feet. The destroyers have an acting radius of about 3000 miles.

The armament consists of four 4-inch rapid fire guns, all mounted on the centerline of the vessel, and four 18-inch torpedo-tubes.—*International Marine Engineering,* April.

THE FLEET OF FRANCE.—It is interesting to note that our Ally across the Channel is copying us in making use of ships in her "Special Reserve," which had become too slow and feeble to meet the necessities of the first line of to-day, and had been relegated to obscure moorings to await the day when they would pass under the hammer to the shipbroker. Many of these vessels, as in the case of our own "forlorn hope'" fleet, have been again fitted out and are being put to useful duties in all parts of the world. They recently assisted British ships of the same description in the defence



ONE OF THE NEW FRENCH DESTROYERS ON TRIAL

of the Suez Canal against the Turks, and old though their guns were, they were more than a match for the field guns and heavy artillery which accompanied the Sultan's army, doing great execution among the Turks who attempted to cross the Canal. In fact, they make excellent floating forts and batteries for the protection of our own and the French Colonial harbors against such light raiding cruisers as the Germans have been using, of the *Karlsruhe* type, and also for protecting the sea bases from which our troops are operating against the inland towns of the colonies of our enemies. In performing this work they set free more modern ships for the duties that are being carried out by Sir John Jellicoe's grand fleet in the North Sea, and Admiral La Lapeyrere's Allied fleet in the Adriatic, who hold Germany and Austria, respectively, firmly by the throat. The old armored cruisers of the French Navy are proving more useful to the French nation than could ever have been anticipated by their best champions a decade ago.—*United Service Gazette,* 3/4.

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Grosser Kurfürst	26,575	23	10 12-in., 14 5.9-in., 12 3.4-in.	Hamburg	Commissioned
Markgraf	26,575	23	same	Bremen	"
König	26,575	23	same	Wilhelmshaven	"
Kronprinz	26,575	23	same	Germania	Launched Feb. 21, 1914
Ersatz Worth	29,000	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913	29,000	....	same	"	" May, 1913
Ersatz Friedrich III	30,000	....	8 15-in., 18 5.9-in.	....	" summer 1914
Cruisers of the Line					
Lützow	28,000	28.5	8 12-in., 14 6-in.	Dantzig	Launched Nov. 29, 1913
Derfflinger	26,500	28.5	same	Hamburg (Blohm & Voss)	Commissioned
Ersatz Hertha	28,000	28.5	8 12-in.	Wilhelmshaven	Laid down July, 1913
Ersatz Victoria Louise	....	....	....	....	" summer 1914
Protected Cruisers					
Karlsruhe	4,900	28	12 4.1-in., 2 t. t.	Germania	Commissioned
Rostock	4,900	28	same	Howaldt	"
Regensburg	4,900	27.5	12 4.1-in.	Bremen	"
Graudenz	4,900	27.5	12 14.1-in.	Kiel	"
Ersatz Hela	5,500	27.5	10 6-in.	"	Laid down fall 1913
Ersatz Gefion	5,500	27.5	same	Stettin	" "
Ersatz Niobe	....	....	....	....	" summer 1914
Ersatz Gazelle	....	....	....	....	same

NOTE.—Germany has twelve destroyers and twelve or more submarines under construction. Tonnage of ships building uncertain. Changes in construction program because of war are problematical.

SECRET SUBMARINE PROGRAM.—Max Laubeuf, inventor and first constructor of submarines in Europe of the types now used by the French, British and German navies, lecturing March 27 before the Society of Civil Engineers, stated that to his certain knowledge the secret program of the German Admiralty last year was to have 300 submarines of the model of the famous *U 29*. The latest experiences indicate, in the opinion of Laubeuf, that submarines are not inferior to their task, but that Germany has not enough of them. Submarines must return frequently to their home ports, and Germany has not and never can have a sufficient number to start hostilities and to replace those that must return to port.—*Army and Navy Journal*, 4/3.

CHARACTERISTICS OF "U 36."—The characteristics of *U 36*, the boat which captured the two Dutch steamers off the Maas Lightship on March 18, are reproduced in *U 32*, which on Thursday sank the *Delmira* in the Channel. Those on board the steamer describe her as very fast and large, with a speed of about 20 knots on the surface. It was *U 32* that an American newspaper correspondent was permitted to see fitting out at Kiel last November. This writer said "The Germans appear to be banking on a new 'super-dreadnought-submarine,' one of which is *U 32*." He was allowed to inspect her while her commander recited the list of British super-dreadnoughts which he hoped before long to send to the bottom. A boat numbered 27 was known to be in commission in the summer of 1914. There is nothing, therefore, to be surprised at if a dozen more beyond this number have been added since, and it is quite possible that about half of these are the size of Nos. 32 and 36.—*London Times*, 3/27.

MILITARY TRAINING OF YOUTH OF GERMANY.—A proclamation issued by the German Government with reference to the military training of youth, which gives a good sidelight on German methods, has been translated by 1st Lieutenant Walter J. Buttgenbach, C. A. C., from the *Politisches Tageblatt* of Aachen, dated September 12, 1914. The proclamation is signed by the Ministers of Education, War and the Interior, and is as follows:

BERLIN W. 66, August 16, 1914.

The Ministry of War.

Proclamation with reference to the military training of youth during the present time of mobilization.

The time of war is upon us, which demands of everyone the utmost exertion and sacrifice. Moreover, our young men who have reached their sixteenth year or over, should, if it be necessary, be made use of in aiding in such auxiliary military work as far as their physical condition permits.

To this purpose, and having in view their subsequent service in the army and navy, a special military preparation is demanded.

For this purpose it is thought best to assemble immediately all young men belonging to the various young men's associations at the larger localities, or combining the several smaller localities together, so as to train them in accordance with the scheme herewith outlined by the Ministry of War.

It is to be expected that also those young men that up to this time have not joined such associations for physical and other training make it a point of honor, on behalf of their native land, that they voluntarily take part in the exercises here outlined.

In the various provinces the further details, especially those with reference to military training, will be in the hands of the present military headquarters, and those in Prussia will make use of the regular administrative units connected with the care of youth.

All authorities are hereby directed to aid and advance in all ways possible the military training of our growing manhood. To those who have already taken up this work, it is asked that they not only continue it in their present loyal zeal, but also seek to find others who will aid.

Outline of military training for young men during time of war.

In the various year classes of 16 and above, to which the many thousands of our youth belong that have already volunteered for service in war, but had to be refused, the preparation for war service is most important and will be carried out as far as it be possible without arms.

Before all things there is to be inculcated the spirit of patriotism, of courage and of decision; their devotion to their country, for Kaiser and empire be kindled by the thought of the great danger in which they are.

It is to be made clear to them that Germany will go under unless it wins, so that we must conquer, and every defender of his country, even to the youngest, must have in his heart the determined will thereto.

The exercises contemplated will include the following:

1. Rapid silent assembling in the simpler formations: the line, column of subdivisions. Assembling in the same formations, from a halt, or in marching in various directions, at a given signal of the instructor. The subdivisions into platoons and sections to follow that of an infantry company.

2. The taking up of extended order from these formations, and the rapid reassembly in silence. Young men be required that they individually maintain touch and direction.

3. Some of the simple movements in column of subdivisions without step, with changes in direction, by command and by signal.

4. Practice in marching with regard to marching regulations, especially those of hygienic character. Regulating the length of step and its cadence. A long, open step is to be sought after. The marching out and marching

back from the drill ground may be made use of for this work, gradual increasing of the length of march so as to increase marching ability.

5. A knowledge of the terrain is to be combined with this.

6. Formation of a skirmish line, movement of sections, platoons in the open to be always combined with unanticipated commands for assembling, so as to cultivate attention.

7. Every movement of these detachments of young men shall give impression of energy and keenness, without attempting to obtain the rigid precision of drill. Without fail, however, the prompt carrying out of the commands and the orders of the instructor are to be insisted upon. Prompt answers and stepping out of those called upon should be sought after.

8. Simple lessons of terrain, its significance and value for combat, with a short talk of the action of present arms.

9. Description of terrain giving details as a preparation of recognizing them as aiming points.

10. Eye exercises of all kinds.

11. Estimating distance.

12. Rapid estimation and counting of the same units.

13. Memorizing, as preparatory practice, for making reports, of certain given observations.

14. Practice for developing the hearing.

15. Reading of signs, so as to draw correct conclusions from things observed in the terrain.

16. Exact and absolutely reliable repetition of certain given observations.

17. Correct repetitions of short orders.

18. Correct guiding of others in the country.

19. Use of watch, compass, telephone, knowledge of Morse alphabet.

20. Use of maps.

21. Visual signaling.

22. Wall scaling, tree climbing.

23. Minor helpful work, such as cordage, making of floats, rafts, pontoons, foot bridges, lookout stations, crossings of all kinds. Besides pitching camp, building huts, cooking pits, making of fires, cooking, camp arrangements of all kinds.

24. Making of litters, first aid to the injured.

25. Use of terrain with reference to cover and as means of approach to the enemy.

26. Intrenching of a firing line, laying out shelter trenches.

27. Advance from cover, falling back to cover.

28. Solution of very simple problems of two small detachments operating against one another.

29. Explanation of outpost work, the posting of an outpost, etc.

30. In all these exercises every opportunity is to be sought to have the young men given independent problems in duty as orderlies, communication, relay and reconnaissance service, so that they develop independence, responsibility and trustworthiness.

31. All means are to be made use of to strengthen their endurance and will power. No task that they have once begun is to be left unfinished. Everyone has his duty to do to the utmost limit.

32. The usual physical development by means of calisthenics, gymnastics, running, simple games, etc., a part of the usual training of our young men, is to be kept up as before, and to be done oftener rather than being kept at it a longer time.

33. In the evening simple theoretical instruction will be given, taking up the subjects of field and garrison guard duty, etc. Before all things the

heart of youth is to be fired by telling them of the deeds of their ancestors, telling them stories from the front, and thus develop in them anger against the enemy that at present on the eastern frontier, where he has entered German territory, is burning up all villages and driving out or killing the inhabitants.—*Army and Navy Journal*, 4/17.

GERMAN PREPARATIONS.—It has already been pointed out how in many ways Germany had made her plans for swift and effective action on the high seas when war should be declared. In the course of the suits against the North German Lloyd liner *Kronprinzessin Cecilie*, now being tried at Boston for failure to deliver gold and passengers in Europe last August, Captain Pollack testified that when he assumed command of the vessel in 1912 he received from the former captain a sealed envelope of instructions which he was not to open until he received a message saying that someone was ill, signed "Siegfried." The latter was the code name of the director of the steamship line to which the vessel belonged. On the night of July 31, when the *Kronprinzessin Cecilie* was a thousand miles from Plymouth, she received this wireless message: "Eberhardt suffered attack catarrh bladder.—Siegfried." Captain Pollack opened the envelope and found in it a code which gave the meaning of "bladder" as "War has broken out with England, France, and Russia." The chief significance of this story is that this large German liner and potential commerce raider should have been advised that war had actually broken out on July 31, whereas it was not until August 1 that the declaration against Russia was made, August 3 that France came into the conflict on the violation of the neutrality of Luxembourg and Belgium, and August 4 (at 11 p. m. at night) that the British ultimatum expired. Some time ago, it will be remembered, the fact was revealed that the German wireless stations in the Pacific had been notified of the war as early as August 1.—*Army and Navy Gazette*, 4/10.

FIRE ON BOARD SHIP.—It is a notable circumstance that the German ships which have been in action in the course of the present war have all suffered heavily owing to fires started by British shells. Against this danger the Germans took greater precautions than were adopted in any other navy. For the past 15 years it had been the practice of the enemy to eliminate, as far as possible, all wood from his men-of-war. Chemists were called upon to suggest suitable substitutes, and it was believed by German naval officers generally that ships had been produced which could in no circumstances be set on fire. It is, therefore, all the more remarkable that in every action which has occurred the Germans have suffered seriously from this cause. In the despatches British admirals refer to the fact that fires were caused, and that these, spreading to the magazines, resulted in explosions which proved fatal. The enemy has not been singular in misfortune. Captain Luce, in his account of the sinking of the *Good Hope* and *Monmouth*, stated that "enemy, firing salvos, got range quickly, and their third salvo caused fire to break out on fore part of both ships, which were constantly on fire till 7.45 p. m." The enemy began the action a few minutes after 7 o'clock, and at 10 minutes to 8 an "immense explosion occurred on *Good Hope* amidships, flames reaching 200 feet high." According to Captain Luce, "total destruction followed." Nothing is known as to the circumstances in which the *Monmouth* sank, for no despatches describing this or any other action have been issued by the enemy. The presumption is that from the opening of the engagement until she sank, nearly two and a half hours later, the *Monmouth* was engaged in fighting the flames on board. The experience of war has certainly suggested that the problem of eliminating this peril to ship and crew has not yet been solved. It is not certain that anything further can be done, but at any rate the matter is one which well deserves further investigation.—*Naval and Military Record*, 3/24.

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Benbow	25,000	22	10 13.5-in., 16 6-in.	Beardmore	Commissioned
Emperor of India	25,000	22	same	Vickers	Commissioned
Iron Duke	28,000	22	same	Portsmouth	Commissioned Mar., 1914
Marlborough	25,000	22	same	Devonport	Trials Mar., 1914
Qu'n Eliz'b'h	27,500	25	8 15-in., 16 6-in.	Portsmouth	Launched Oct. 16, 1913
Warspite	27,500	25	same	Devonport	" Nov. 26, 1913
Valiant	27,500	25	same	Fairfield	" Dec., 1913
Malaya	27,500	25	same	Walker	Laid down Oct. 20, 1913
Barham	27,500	25	same	Brown & Co.	Launched Feb., 1914
Roy'l Sover'gn	25,500	21	same	Portsmouth	Laid down, Jan. 15, 1914
Royal Oak	25,500	21	same	Devonport	" Jan. 15, 1914
Resolution	25,500	21	same	Palmer	" Nov. 28, 1913
Ramillies	25,500	21	same	Beardmore	" Nov. 12, 1913
Revenge	25,500	21	same	Vickers	" Jan., 1914
Battle Cruisers					
Tiger	30,000	30	8 13.5-in., 12 6-in.	Brown & Co.	Launched Dec. 15, 1913
Light Cruisers					
Brisbane	5,400	25	9 6-in., 4 3-pdrs.	Sydney	Laid down Jan. 25, 1913
Birmingham	5,440	25.5	same	Elswick	Commissioned, Feb. 3, 1914
Lowestoft	5,440	25.5	same	Chatham	" Apr. 21, 1914
Nottingham	5,440	25.5	same	Pembroke	" Apr. 3, 1914
Aurora	3,600	30	2 6-in., 8 4-in.	Devonport	Commissioned
Arethusa	3,600	30	same	Chatham	Commissioned
Penelope	3,600	30	same	Barrow	Laid down Feb. 1, 1913
Phaeton	3,600	30	same	"	" March 12, 1913
Royalist	3,600	30	same	Dalmuir	" June 3, 1913
Galatea	3,600	30	same	"	Commissioned
Inconstant	3,600	30	same	"	Laid down April 3, 1913
Undaunted	3,600	30	same	Govan	Commissioned
Cleopatra	4,400	30	.....	Devonport	Laid down Feb. 26, 1914
Calliope	4,400	30	.....	Chatham	" Jan. 1, 1914
Conquest	4,400	30	.....	"	" Feb. 28, 1914
Cordelia	4,400	30	.....	Pembroke	Launched Feb. 23, 1914
Carysfort	4,400	30	.....	"	Laid down Feb. 25, 1914
Comus	4,400	30	.....	Wallsend	" Nov. 3, 1913
Caroline	4,400	30	.....	Birkenhead	" Jan. 28, 1914
Champion	4,400	30	.....	Hebburn	" Feb. 28, 1914

* NOTE.—England has approximately 31 destroyers and 24 submarines under construction. (Changes in construction program since war are unknown).

THE BATTLE CRUISER "TIGER."—The recently completed battle cruiser *Tiger* may be regarded as the "last word" in vessels of this valuable type. Although the *Tiger* was not placed in commission until after the outbreak of hostilities, she has already played a most useful and conspicuous part, as will be seen by Vice-Admiral Sir David Beatty's despatch recording the action in the North Sea on January 24.

Official details of the *Tiger* are not for the present available, but it is understood that she has a displacement of 28,000 tons, and that her main dimensions are: Length, 660 feet; beam, 90½ feet; and draft, 28¼ feet. With an indicated horse-power of 100,000, her turbine engines produce a speed of 28 knots. She was built and engined by Messrs. John Brown & Co., Clyde Bank. The only details of the vessel's armament published are that she possesses eight 13.5-inch guns as her main, and twelve 6-inch guns as her secondary armament. Her coal capacity is 3000 tons.—*Naval and Military Record*, 3/10.

NAVAL COURTS-MARTIAL.—The recent discussion in the House of Commons on the action of the Admiralty in using its discretionary powers with reference to the holding of courts-martial has drawn an interesting expression of opinion from Lord George Hamilton, who was not only First Lord for seven years, but has no political sympathy with the present government. His opinion is that a court-martial in peace time constitutes a safeguard to the officer whose conduct is impugned and a convenience to the Admiralty, which has frequently altered, and has always possessed the power to overrule, the decision of the court. Lord George Hamilton holds that in war time these considerations are completely overshadowed; it is "very difficult, if not impossible, to employ courts-martial in this sense." It is held by this ex-First Lord that in time of war the Admiralty must act at once and cannot wait for the decision or advice of a body which is necessarily subordinate to supreme authority. If an officer is held to have erred, in Lord George Hamilton's opinion, the Admiralty must summarily remove him from his post. "To try this man subsequently by court-martial is to give the court-martial the power of reviewing the executive decision arrived at by the government in time of war." In other words, Lord George Hamilton holds that in peace the Admiralty can await the decision of a court-martial and then act; but in war, when quick decisions are necessary and great issues are in the balance, the Admiralty must itself sift the facts with the greatest possible rapidity and then act.—*Naval and Military Record*, 3/10.

A DIFFERENT VIEW.—In the course of his interesting letter, Admiral Sir M. Culme-Seymour, who, as he observes, joined the service 65 years ago, has been continually employed, and was two years private secretary at the Admiralty, says: "When a naval officer is seriously found fault with by the Admiralty, or his superiors, it has always been considered he has a right to be tried by his peers—viz., by court-martial. He may be acquitted or condemned; if the latter, a sentence is passed, and is not required to be approved by the Admiralty. The Admiralty cannot reverse the acquittal, and they cannot increase the sentence, though they may reduce it. Of course, the Admiralty could put the officer on the shelf, or punish him indirectly, if he was acquitted, but the officer knew he had been acquitted by his peers, and he counted the opinion of his brother officers higher than the opinions of the Admiralty. At one time, no doubt, the Admiralty tried to interfere with the working of the court-martial, notably the Fairfax court-martial, but their doing so was strongly resented by the late Admiral Sir Geoffrey Hornby and all the leading officers of the service." Coming from an officer of Sir M. Culme-Seymour's service and distinction, this letter is most interesting, and on the main question the following sentences are especially significant: "I do not go into the question of a court-martial being a good thing in peace time and not in war. Obviously, if good in peace, it must be vitally important to the naval officer in war. There were plenty of courts-martial in the old wars, and there is no difficulty whatever in holding them now."—*Naval and Military Record*, 3/10.

CAPTAIN'S APPOINTMENT.—Capt. C. A. Fountaine, who has been appointed to the *Columbine*, additional, as captain on the staff of Admiral Sir R. S. Lowry (commanding on the coast of Scotland), was last month specially promoted to that rank from commander of the *Lion*, Sir David Beatty's flagship. He is the youngest officer of his rank on the list, as he will not be 35 until May.—*Naval and Military Record*, 4/7.

IMPORTANCE OF SPEED, BIG GUNS AND GUNNERY TRAINING.—Having decided to publish the despatches of Sir Doveton Sturdee and Sir David Beatty, the Admiralty were well advised in issuing them together. The two

actions have many points in common. Both illustrate in a striking fashion the advantages of the principles involved in what we call the battle cruiser design. These principles are a very heavy battery combined with very high speed. This design differs from that of the battleship proper—soon doomed to disappear—inasmuch as a preponderance of fire from heavy guns of one caliber is substituted for a large quantity of armor as a protection for the ship; and secondly, an enhanced speed for a heavy secondary battery with poor range. The conservatism of the navy prevented the further application of these principles until they had been tested by battle. We take it for granted that there can be few people, certainly among our younger officers, who would not prefer that the whole of our super-"dreadnoughts" were of the *Lion* type, that is to say, they would prefer eight big guns with 28 knots speed to ten big guns with only 21 knots, even if a certain amount of armor had to be taken away in consequence. Even in the case of the *Queen Elizabeth*, in which we all take such pride, for our part we could wish that in her design some of the armor and the 6-inch guns had all been thrown overboard and the weight utilized for one more big gun turret and five knots more speed. No better proof of the value of the battle-cruiser design can be desired than is given by the crushing blow which Admiral Sturdee was able to deliver off the Falklands within a little over a month after Cradock's loss. It has been said that because the German ships in the Dogger Bank action were also of the battle-cruiser type this leaves the matter in doubt. We cannot agree. Coupled with heavy guns, scientific marksmanship is essential, but this is the case with any class of ship and gun. British seamen have been taught by these two actions the value of the constant training they have been given in gun practice and gunnery technique during the last few years. There have been cavillers and scoffers at the reforms initiated in 1905, when gunnery training was given not only more importance than paint work, but made the criterion of a ship's efficiency; we do not, however, hear from them now. There are other lessons, of course, to be learned from these two actions. They conformed to the rule, to which Cradock's engagement was an exception, that one of the opposed forces in a sea battle is always less ready to fight than the other. Both off the Falklands and off the Dogger Bank the enemy ran away. The effect of such tactics upon the morale of the seamen in the flying fleet need not be enlarged upon. Nor need we dwell upon the strategy and tactics involved. It is the highest test of the strategist's capacity that he should place the right force in the right place at the right time. That this was done on both these occasions everybody must acknowledge. It is for the tactician to make the best use of the advantages thus given him, and when his enemy runs away the tax upon his ability is less pronounced by the circumstances of the case. Having, as it were, all the cards in his hand, prompt decision to act is the first requirement, and then a stubborn determination not to relinquish his hold until annihilation is achieved.—*Army and Navy Gazette*, 3/6.

BRITISH AT TARGET DRILL

WASHINGTON, April 1.

The State Department to-day received the following cablegram from Consul General Skinner at London:

"The Admiralty warns all shipping that target practice is likely in Portland harbor without notice."

No further explanation has been obtained by the department.—*N. Y. Times*, 4/2.

GREECE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruisers					
Salamis	19,500	23	8 14-in., 12 6-in., 12 3-in.	Vulkan Works, Stettin	Laid down July, 1912
.....	24,000	21.5	10 14-in.	Saint Nazaire	Reported that negotiations have been completed for this ship.

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Giulio Cesare ...	22,022	22	13 12-in., 18 4.7-in.	Genoa	Completed
Conte-di-Cavour	22,022	22	13 12-in., 18 4.7-in. 14 14-pdr.	Spezia	"
Leonardo da Vinci	22,022	22	same	Genoa (Odero)	"
Andrea Doria...	22,564	23	13 12-in., 16 6-in.	Spezia	Launched March 30, 1913
Duilio.....	22,564	23	same	Castellamare	" April 24, 1913
4 ships	28,000	24	8 15-in., 16 6-in.	....	Will probably be laid down during spring and summer, 1915
Small Cruisers					
Basilicata	2,500	16.5	6 6-in.	Castellamare	Laid down Aug. 9, 1913
Campania	2,500	16.5	6 6-in.	"	" Aug. 9, 1913

NOTE.—Italy has about 15 destroyers and two submarines under construction.

THE ITALIAN FLEET.—The influence which the Italian Navy can exercise on the course of the war if she intervenes on behalf of the Allies is a subject of some interest. Prior to the dramatic expansion of the German Navy and the growth in recent years of the fleets of the United States and Japan, Italy was regarded as one of the great sea powers of the world. The standing of her navy was affected for a time by the battle of Lissa, but only for a time. The Italian Government took to heart the lessons which this famous encounter enforced, and during the next 20 or 30 years great progress was made in increasing the number of modern ships and adding to the personnel. Italy, like France, has, however, suffered from repeated changes in the direction of affairs at the Ministry of Marine, and though from time to time ambitious programmes have been put forward, construction has almost invariably proceeded slowly. In the early years of the present century Italy, however, still continued to hold, at least on paper, a commanding position in southern waters. Then at last, under the inspiration of Berlin, the Austro-Hungarian Government determined upon an active shipbuilding policy. In the last years of the nineteenth century Austria laid down six small battleships, ranging in displacement from just over 5000 to 8200 tons. In 1901 three ships of over 10,000 tons were commenced and these were succeeded in 1907 and 1908 by the three battleships of the *Radetzki* class—smaller *Lord Nelsons*—with a displacement of about 14,000 tons and an armament of four 12-inch and eight 9.4-inch guns. During these years Austria-Hungary gained considerably on Italy, and

then, within a few months of one another, the two powers entered upon the construction of dreadnoughts, Austria adopting a type of ship with a displacement over 1000 tons greater than that of the initial Italian ship. There was no great dissimilarity in the armament, but the Italian vessel sacrificed a measure of armor protection in order to gain increased speed. Only one of these small Italian dreadnoughts was laid down—the *Danté Alighieri*—and then the Italians began the construction of five ships more than 2000 tons heavier than the vessels in hand in the shipyards of the adjoining country.

The following shows the standing of the two fleets on July 1:

	Italy				*Austria-Hungary*			
	Built		Building		Built		Building	
Battleships	*No.*	*Tons*	*No.*	*Tons*	*No.*	*Tons*	*No.*	*Tons*
Dreadnoughts	3	62,644	7	187,150	3	60,030	4	93,510
Pre-Dreadnoughts	8	96,100	..	.....	6	74,613	..	.....
Coast defence vessels	..	.....	..	.....	6	41,700	..	.....
Armored cruisers	9	74,020	..	.....	2	13,380	..	.....
Protected cruisers	6	18,830	2	4,888	5	13,815	5	21,216
Destroyers	36	16,807	15	14,203	18	9,450	..	.....
Torpedo boats	68	11,584	2	272	39	6,852	24	5,886
Submarines	19	5,475	8	5,842	6	1,686	6	5,370
		285,460		22,355		221,526		125,982
Grand totals		497,815				347,508		

It is doubtful if in the past nine months Austria has completed her fourth ship of the dreadnought class, the *Szent Istvan*, which was launched on January 17, 1914. In view of the fact that this was the first dreadnought to be built in Hungary, it is probable that this unit has not yet hoisted the pennant. In the meantime it is possible that Italy has doubled the number of her completed dreadnoughts. The last of her six, which was laid down in the spring of 1912, was due for delivery early in the present year. It is almost certain that during the past nine months successful efforts have been made to complete this squadron of ships of the all-big-gun type, and in that event Italy has already regained a considerable lead over her rival.—*Naval and Military Record*, 4/21.

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso	31,300	22.5	12 14-in., 16 6-in.	Kure	Launched Mar. 28, 1914
Fuso 2d	31,300	22.5	....	Kawasaki	Date when these ships will be laid down has not yet been settled.
Fuso 3d	31,300	22.5	....	Mitsubishi	
Fuso 4th	31,300	22.5	....	Yokosuka	Laid down Nov. 20, 1913
Battle Cruisers					
Hiyei	27,500	27	8 14-in., 16 6-in., 8 t. t.	Yokosuka	Commiss'd Mar. 31, 1914
Haruna	27,500	27	same	Nagasaki	Launched Dec. 14, 1913
Kirishima	27,500	27	same	Kobe	" Nov. 30, 1913

NOTE.—Japan has two destroyers and two submarines under construction in England and France respectively.

OUTPUT OF JAPANESE SHIPYARDS IN 1914.—The total output of Japanese shipyards in 1914 amounted to 136,310 gross tons. Nearly 82 per cent of this tonnage, or 111,343 gross tons, consisted of 18 steamers, all of which were above 1000 tons. Of the vessels under 1000 tons, 61 aggregating 14,297 gross tons, were coasting steamers and tugs, and 80, aggregating 10,670 gross tons, were sailing ships.

The particulars of the 18 steamers above 1000 tons are as follows:

Names	Type	Gross Tons	I. H. P.	Built at
		Displ.		
H. M. S. Fuso	Battleship	30,600	40,000	Kure Naval Dockyard
Fushimi Maru	T. S. Pass. & Cargo	11,757	12,000	Mitsu Bishi Dockyard
Suwa Maru	T. S. Pass. & Cargo	11,757	11,211	Mitsu Bishi Dockyard
Yasaka Maru	T. S. Pass. & Cargo	11,813	10,415	Kawasaki Dockyard
Toyooka Maru	T. S. Cargo	7,630	5,800	Mitsu Bishi Dockyard
Toyohashi Maru	T. S. Cargo	7,500	6,000	Kawasaki Dockyard
Tokuyama Maru	T. S. Cargo	7,500	6,000	Kawasaki Dockyard
Harbin Maru	T. S. Pass. & Cargo	5,500	6,500	Kawasaki Dockyard
Peking Maru	S. S. Cargo	3,181	1,648	Osaka Iron Works
Nanking Maru	S. S. Cargo	3,181	1,824	Osaka Iron Works
Chokyu Maru	S. S. Cargo	2,138	1,150	Uraga Dock Company
Hosan Maru	S. S. Cargo	1,104	833	Osaka Iron Works
Isshin Maru	S. S. Cargo	1,484	1,114	Osaka Iron Works
Naha Maru	S. S. Cargo & Pass.	1,040	1,000	Fujinagata Shipyard
Hakushin Maru	S. S. Cargo	1,536	1,272	Mitsu Bishi Dockyard
Yaeyama Maru	S. S. Pass. & Cargo	1,036	953	Mitsu Bishi Dockyard
Miyako Maru	S. S. Pass. & Cargo	1,013	981	Osaka Iron Works
Michi Maru	S. S. Cargo	1,483	764	Tochiki Shipyard
Total		111,343	124,297	

The most interesting vessel built in 1914 was the battleship *Fuso*, of 30,600 tons displacement, which was launched at the building dock at Kure in March, 1914. This vessel, which is one of the largest and most powerful battleships afloat, carries twelve 14-inch guns in six turrets, all arranged on the centerline of the ship. The vessel will go into commission during the latter part of the next year.

In addition to the *Fuso* there are under construction three sister ships, namely the *Yamashiro*, at the Yokosuka Navy Yard, the *Hiuga* at the Mitsu Bishi Dockyard at Nagasaki, and the *Ise* of the Kawasaki Dockyard of Kobe. The propelling machinery of these ships consists of Brown-Curtis turbines and Japanese Admiralty type water-tube boilers, with the exception of the *Hiuga*, which is fitted with Parsons turbines. The battle cruiser *Hiyei* was completed last summer and is now engaged in actual service, while her two sister ships, the *Kirishima* and *Haruna*, are now undergoing speed trials at the Mitsu Bishi Dockyard and the Kawasaki Dockyard, respectively.

After the outbreak of the present war, a supplementary budget was passed in the special session of the Diet, held last September, authorizing the construction of 10 destroyers of 600 tons displacement and 9500 indicated horsepower, to be completed in about six months. Contracts for the construction of two of these vessels were placed with the Mitsu Bishi Dockyard, two with the Kawasaki Dockyard, and one each with the Osaka Iron Works and the Uraga Dock Company. The hulls, machinery and equipment of these vessels will be constructed entirely in Japan.—*International Marine Engineering*, April.

NORWAY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruisers					
Bjorgvin.....	5000	16.5	2 9.4 in., 4 6-in., 6 4-in.	Messrs. Armstrong	Laid down Jan. 8, 1913
Nidaros.....	5000	16.5	same	same	Launched June 9, 1914

NOTE.—Norway has four submarines under construction. (Vessels building in England have been taken over as a war measure.)

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol....	23,026	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,026	23	same	" "	" Sept. 9, 1911
Poltava.....	23,026	23	same	New Admiralty	" July 10, 1911
Gangut	23,026	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,435	21	12 12-in., 20 4.7-in.	Nikolaieff	" Apr., 1914
Empress Marie	22,435	21	same	Ivan Bunge Co.	" Nov. 3, 1913
Catherine II...	22,435	21	same	" " "	Laid down Sept. 1, 1912
Battle Cruisers					
Ismailia.....	32,200	28	12 14-in., 21 5.1-in.	Galerni	" Dec. 19, 1912
Kinburn.....	32,200	28	same	Baltic Works	same
Borodino.....	32,200	28	same	Galerni	same
Navarino.....	32,200	28	same	Baltic Works	same
Small Cruisers					
Adm. Butakow	7,500	32	15 5.1-in.	Putilow, St. Petersb.	Laid down Nov. 29, 1913
Adm. Spiridov.	7,500	32	same	" "	" Nov. 29, 1913
Svietlana.....	7,500	32	same	Neval	" Dec. 7, 1913
Adm. Grieg....	7,500	32	same	"	" Dec. 7, 1913
Muravjev Amurski	4,500	..	8 5.1-in.	Elbing	Launched Apr. 11, 1914
Adm. Nevelskoj	4,500	..	same	"	Laid down Feb. 13, 1913
" Lazarev...	7,500	32	15 5.1-in.	N. F. & W. Nikolaieff	" Oct. 19, 1913
" Nachimow	7,500	32	.....	R. S. Co. "	same

NOTE.—Russia has about 45 destroyers and 19 submarines under construction or contract.

EIGHT RUSSIAN DREADNOUGHTS APPROACHING COMPLETION.—An important fact affecting the naval situation in the Baltic, of which little public mention has been made, is that the Russian fleet in those waters will shortly be augmented by the addition of eight new dreadnoughts of great size and power, which are nearing completion and will probably go into commission during the present year. Four of these ships, the *Sebastopol, Petropavlovsk, Poltava* and *Gangut,* are dreadnoughts of 23,026 tons displacement, 23 knots speed, carrying each twelve 12-inch guns and sixteen 4.7-inch guns. They were launched between June and October, 1911, and work upon them having been accelerated, they should be in commission before many months have passed. The other four will be the largest battle cruisers afloat.

They are named the *Ismalia, Kinburn, Borodino* and *Navarino*. The displacement of these ships is 32,200 tons, the speed 28 knots, and each of them will carry the enormous battery for a battle cruiser of twelve 14-inch guns any twenty-one 5.1-inch guns.—*Scientific American, 3/27.*

SPAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Espana.....	15,450	19.5	8 12-in., 20 4-in.	Ferrol	Commiss'd Oct. 23, 1913
Alfonso XIII..	15,450	19.5	same	"	Launched May 7, 1913
Jaime I.....	15,450	19.5	same	"	Laid down Feb. 5, 1912

NEW SPANISH NAVY BILL.—Immediately after the opening of the Chamber, says a Reuter message from Madrid recently, a new Navy Bill was introduced providing for an expenditure of 260,600,000 pesetas (over £10,000,000). This sum is subdivided as follows: Four fast cruisers, 60,000,000 pesetas; six destroyers, 30,000,000 pesetas; 28 submarines with salvage and repairing material, 110,000,000 pesetas; three gunboats, 9,000,000 pesetas; 18 coastguard minelayers, 6,000,000 pesetas; submergible mines and other submarine defences, 9,000,000 pesetas; aerial material and for trials, 6,000,000 pesetas; basins, storehouses, jetties, and other works at Ferrol, 3,900,000 pesetas; basins, storehouses, jetties, and other works at Cadiz, 9,075,000 pesetas; basins, storehouses, jetties, and other works at Cartagena, 6,350,000 pesetas; torpedo craft and submarine harbors, 2,000,000 pesetas; floating pontoons, 3,800,000 pesetas; floating material (tugs, lighters, etc.), 5,475,000 pesetas.—*Army and Navy Gazette, 3/27.*

SWEDEN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruiser					
Sverige.....	7100	22.5	4 11-in., 8 5.4-in.	Gothenburg	Laid down Feb. 15, 1913

UNITED STATES

LAUNCH OF U. S. S. "PENNSYLVANIA."—Without the slightest hitch the 31,400-ton battleship *Pennsylvania*, the most powerful warship in the U. S. Navy and ranking among the most powerful in the world, was launched at Newport News, Va., at 10 a. m. March 16, 1915.

Some of the principal characteristics of the *Pennsylvania* are as follows: Length on load water-line, 600 feet; length over all, 608 feet; breadth, extreme, load water-line, 97 feet ½ inch; depth to weather decks, main and upper, respectively, 46 feet and 53 feet 9 inches; mean draft to bottom of keel at trial displacement, 28 feet 10 inches; number of decks, five, with bridge deck and two platforms; number of compartments, about 400; mean trial displacement, 31,400 tons; speed, 21 knots.

NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR
VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY, MAY 10, 1915

Name, type and no. of vessels	Contractor	Per cent of completion			
		May 1, 1915		Apr. 1, 1915	
		Total	% on ship	Total	% on ship
Battleships					
36 Nevada	Fore River S. B. Co.	91.7	90.9	89.7	87.9
37 Oklahoma	New York S. B. Co.	92.9	92.9	90.7	90.6
38 Pennsylvania	Newport News S. B. Co.	76.9	72.1	73.9	68.5
39 Arizona	New York Navy Yard	59.2	55.4	56.4	52.0
40 California	New York Navy Yard	0.0	0.0	0.0	0.0
41 Mississippi	Newport News S. B. Co.	17.9	13.3	14.6	.....
42 Idaho	New York S. B. Co.	25.2	10.0	20.3	6.9
Destroyers					
51 O'Brien	Wm. Cramp & Sons.	97.3	97.3	96.9	96.9
52 Nicholson	Wm. Cramp & Sons.	Del'v'd	4-30-15	96.9	96.8
53 Winslow	Wm. Cramp & Sons.	92.0	91.8	91.4	91.2
55 Cushing	Fore River S. B. Co.	92.0	91.9	88.0	87.6
56 Ericsson	New York S. B. Co.	96.3	96.3	95.4	95.4
57 Tucker	Fore River S. B. Corporation	61.7	57.7	49.5	45.2
58 Conyngham	Wm. Cramp & Sons.	67.5	65.3	64.2	62.1
59 Porter	Wm. Cramp & Sons.	66.3	63.9	62.5	60.2
60 Wadsworth	Bath Iron Works.	91.2	91.2	85.1	85.0
61 Jacob Jones	New York S. B. Co.	68.0	67.5	66.3	64.8
62 Wainwright	New York S. B. Co.	66.9	66.4	63.8	62.3
63	Fore River S. B. Corporation	19.5	12.7	11.7	.....
64	Fore River S. B. Corporation	18.6	9.8	11.7	.....
65	Bath Iron Works	10.5	3.9	7.6	.....
66	Bath Iron Works	10.5	3.9	7.8	.....
67	Wm. Cramp & Sons.	7.3	1.5	4.2	.....
68	Mare Island Navy Yard	0.0	.....	0.0	.....
Destroyer Tenders					
2 Melville	New York S. B. Co.	88.0	87.9	83.4	83.1
Submarines					
27 G-2[1]	Lake T. B. Co. (Bridgeport).	89.7	89.7	89.7	89.7
31 G-3[1]	Lake T. B. Co. (Bridgeport)	88.6	88.4	88.6	88.4
40 L-1	Electric Boat Co. (Quincy)	95.8	95.8	92.2	92.0
41 L-2	Electric Boat Co. (Quincy)	97.0	97.0	90.2	89.9
42 L-3	Electric Boat Co. (Quincy)	90.3	90.3	88.9	88.3
43 L-4	Electric Boat Co. (Quincy)	90.0	90.0	85.8	84.2
44 L-5	Lake T. B. Co. (Bridgeport)	66.8	62.6	63.0	58.9
45 L-6	Lake T. B. Co. (Long Beach, Cal.)	59.0	53.6	55.8	50.4
46 L-7	Lake T. B. Co. (Long Beach, Cal.)	57.2	51.4	54.7	48.8
47 M-1	Electric Boat Co. (Quincy)	73.3	68.1	70.0	64.7
48 L-8	Portsmouth, N. H., Navy Yard	26.3	24.2	18.2	15.5
49 L-9	Electric Boat Co. (Quincy)	66.0	58.1	60.7	52.3
50 L-10	Electric Boat Co. (Quincy)	64.3	55.3	59.9	50.5
51 L-11	Electric Boat Co. (Quincy)	52.7	42.0	46.4	36.0
52	Electric Boat Co. (Quincy)	0.0	.....	.....	.....
53 N-1	Electric Boat Co. (Seattle)	0.0	.....	.....	.....
54 N-2	Electric Boat Co. (Seattle)	0.0	.....	.....	.....
55 N-3	Electric Boat Co. (Seattle)	0.0	.....	.....	.....
56 N-4	Lake T. B. Co. (Bridgeport)	14.5	11.4	9.4	.....
57 N-5	Lake T. B. Co. (Bridgeport)	11.9	8.6	.....	.....
58 N-6	Lake T. B. Co. (Bridgeport)	11.2	7.9	.....	.....
59 N-7	Lake T. B. Co. (Bridgeport)	11.2	7.9	.....	.....
Submarine Tenders					
2 Bushnell	Seattle Construction & D. D. Co.	88.3	83.5	86.2	81.2
Fuel Ships					
13 Kanawha	Mare Island Navy Yard	100.0	100.0	99.2	99.2
14 Maumee	Mare Island Navy Yard	87.3	86.7	81.3	80.7
15 Cuyama	Mare Island Navy Yard	0.0	0.0	.....	.....
Miscellaneous					
Supply Ship No. 1	Boston Navy Yard	13.4	4.4	11.5	2.8
Transport No. 1	Phila. Navy Yard	13.4	6.3	11.5	.....
Pan. Canal Colliers					
Ulysses	Maryland Steel Co.	Del'v'd	4-17-15	97.5	97.0
Achilles	Maryland Steel Co.	96.8	92.9	90.3	84.9

[1] Contracts forfeited, vessels being completed New York Yard.

Armament: Main battery—Twelve 14-inch 45-caliber breech-loading rifles, four submerged torpedo-tubes. Secondary battery—Twenty-two 5-inch 51-caliber rapid-fire guns, four 3-pounder saluting guns, two 1-pounder guns for boats, two 3-inch field pieces, two .30 caliber machine guns.

Complement—Officers, 65; crew, 863; marine detachment, 74.

Fuel oil capacity, 694,830 gallons, 2322 tons.

The great advance made in naval design and construction is forcibly demonstrated when a comparison is made of the *Pennsylvania* and the dreadnought *Delaware*, launched at the same shipyard Feb. 6, 1909. The *Delaware* has a displacement of 20,000 tons, and five turrets with two 12-inch guns each, a total of ten 12-inch turret guns; while the *Pennsylvania* has a displacement of 31,400 tons, and four turrets with three 14-inch guns each, a total of twelve 14-inch turret guns. The 12-inch guns of the *Delaware* throw four tons of metal at a single broadside; the 14-inch guns of the *Pennsylvania* throw seven and a half tons at a single broadside. The *Pennsylvania* on Feb. 1, 1915, was 67.7 per cent completed, and the contract date of completion is Feb. 28, 1916. The hull will cost $7,260,000, and the total cost of the completed ship will approximate $13,000,000. Her keel was laid Oct. 27, 1913. She has only one funnel, and at first glance resembles the old *Texas* somewhat. She will have two skeleton masts, and the admiral's and captain's quarters are amidships.

The *Pennsylvania* will be propelled by Curtiss turbines operating four screw propellers and developing about 32,000 horse-power. Steam will be supplied by 12 Babcock and Wilcox water-tube boilers, using oil fuel. Provision for the storage of nearly 700,000 gallons of oil gives the ship a wide cruising radius. The oil will be stored in the double bottom. Her twelve 14-inch guns will be mounted in four electrically controlled turrets built on the center line of the ship, with three guns to each turret. They will be so arranged as to make it possible to fire all twelve on either broadside. Two turrets will be located forward of the superstructure and two aft of the smokestack. With this arrangement six guns can be fired dead ahead and six dead astern. The main armor extends nearly the full length of the hull and 8 feet below the water line and will be 11 inches thick. The turret armor will be 15 inches thick. Below the main deck is a protected deck.—*Army and Navy Journal*, 3/20.

SUBMARINE PROGRAMME.—The Navy Department is pushing forward its submarine building programme, Congress having authorized the expenditure of $20,000,000 on under-water vessels—over $5,000,000 for three seagoing submarines of a size and endurance that will enable them to keep the sea and operate in concert with the fleet, and nearly $15,000,000 on 23 smaller craft. Plans for both classes have been decided upon, and it is believed that the seagoing submarines will be of a new type, having a displacement of about 1000 tons when operating on the surface, and a surface speed of about 20 knots.—*Naval and Military Record*, 4/7.

NEW BATTERIES OF U. S. SUBMARINE "L 8."—Work on the submarine *L 8*, which is also the first submarine to be constructed by the navy itself, is progressing steadily although it will probably require eight or nine months' more work before the vessel can be launched. The *L 8*, it is reported unofficially, will have a cruising range on its surface engines of 2500 miles and a total range of 2650. It will carry six torpedoes, making a 32-knot speed, with a range of between 4500 and 5000 yards.

It is claimed for the new Edison batteries that they will give the submarine an undersea cruising range of 150 miles, more than a third longer than that of any present submarine, and will eliminate the dangers to the crew of chlorine and sulphuric acid gas poisoning. Before the *L 8* is launched at Portsmouth another United States submarine will be equipped with the Edison batteries. This is the *E 2*, whose crew suffered from

poisoning by chlorine gas when their craft was submerged near Newport last summer. When the *E 2* was laid up after that accident it was decided to install the Edison batteries, and the *E 2* probably will return to the water equipped with them in a few weeks.

Miller Reese Hutchinson, chief engineer and personal representative of Mr. Edison, speaking of the new battery said: "The Edison battery will eliminate sulphuric acid gas. One of the greatest difficulties with submarines has been the danger from chlorine poisoning. The batteries at present contain sulphuric acid. If it is able to escape, as frequently occurs at present, it eats its way into the inner steel skin of the submarine. If it makes a hole in the chamber into which salt water is admitted, the acid and the salt water produce chlorine. The new Edison battery contains a potash solution and the only metal in it is steel and nickel. The submarine is of steel and it floats in an alkaline solution of salt water. Our new batteries are of steel and contain an alkaline solution—so the cause of the generation of poisonous gases does not exist. Another advantage is that potash absorbs carbonic acid gas. The *L 8* will be equipped with pumps that will run the gas-laden air through the cells filled with the potash solution. There is enough of the potash solution to purify the air for one hundred days. With a little food and water the crew would be able to live that length of time under water provided there was no hole through the inner skin. Potash is a preservative of steel, so that, if any should leak, it would not be dangerous, as the sulphuric acid is.—*Army and Navy Journal*, 4/17.

THE DETECTION OF SUBMARINES BY AIRCRAFT.—The question whether it is possible for aerial observers under certain conditions to detect the presence of submerged vessels is a very interesting one, but, judging by experience in connection with the German submarine "blockade," it would appear that undue importance was attached to the theory before the outbreak of hostilities. However that may be, the Navy Department of the United States has considered it worth while, in connection with its new construction programme, to give special consideration to the color of submarines with the object of rendering them invisible, when submerged, to observers in aircraft, and it is believed to be possible to adopt a color which will render detection and identification difficult, if not impossible. There is a theory, it is stated, that it would be of advantage to have several colors for each vessel instead of adhering to uniformity of shade; in other words, it may be advantageous to adopt what might be called a mottled appearance as a means of protection. The results of the experiments in this direction will be awaited with considerable interest.—*Naval and Military Record*, 4/7.

WAR TRAINING FOR THE NAVY.—Secretary Daniels announces that he is about to put into effect a new plan to give the United States fleet real war training. Heretofore the war games have been prepared by the commander-in-chief of the fleet and his staff, but the order just issued by the secretary gives approval to war game plans prepared jointly by the General Board of the Navy, the Naval War College, and recommended by the Aid for Operations, the result being a coordination of plans of the various elements of the navy, which is believed will result in the establishment of a general staff, and that a working machine will be provided to which all elements that contribute to the navy's functions in time of war will be coordinated in time of peace, which will result in finding the service in a greater state of preparedness should war come. The new plan is the result of more than two years of effort of naval officers of the highest rank, and its accomplishment by the secretary is said to be due in large part to the efforts of Rear Admiral Fiske.

An advantage of the new order is that each war game will have a relation to the preceding one, which, it is believed, will result in building up

what our navy has always lacked, and that is, a continuity of policy with respect to war preparations. Another advantage, and perhaps the greatest, is that there will be built up under the new plan a body of officers in time of peace to perform the services that some one in the navy would have to be prepared to perform if the United States were at war.—*Marine Journal*, 5/1.

WHAT THE NAVAL RESERVE BILL MEANS.—With the generous promises made by the law passed at the last session of Congress for the creation of a Naval Reserve, it is hoped that this second line of defence will soon be organized so as to become effective in case of emergency. There are thousands of honorably discharged enlisted men from the navy whose training makes them preeminently fit to be enrolled in this service and who would be of inestimable value should occasion arise if they can be kept fit by becoming part of the naval reserve. Aside also from the liberal inducements that this measure offers to those enlisted men who for any reason could not find it possible to reenlist at the end of their term, the Naval Reserve proposition should make enlistments of new recruits popular with the young men of this country. Those for instance who enter as soon as old enough to be accepted, for a period of from 16 to 20 years, when they have reached the age of 35 or 40, will be eligible to retire, and by joining the Reserve receive a pay exceeding the normal pension, besides enjoying special opportunity for fixed and honorable employment in civil life.

With the Naval Reserve organized and with our hoped-for expanding merchant marine, there is at present a brighter outlook for the training of a portion at least of our youth to the sea habit than there has been in many a year. So far as the merchant service goes this work is being done by the state schoolships, and while there are all too few of these in existence, those commissioned are doing good service as evidenced by the number of bright young American commanders and officers now serving in our coastwise fleets who are schoolship graduates.—*Marine Journal*, 4/17.

The British Navy in the present war has drawn heavily upon the officers and men of the British merchant service. These officers and men, or the best of them, were under retainer, and in addition received pay for time spent in instruction in gunnery, etc. The adoption of a similar plan by the United States would be in strict accord with American traditions. It would strengthen both the navy and the merchant marine at a minimum cost to the government.—*Boston Evening Transcript*, 4/5.

OFFICE OF CHIEF OF NAVAL OPERATIONS.—The clause enacted in this year's Naval Appropriation Bill, establishing the office of Chief of Naval Operations, is as follows:

There shall be a Chief of Naval Operations, who shall be an officer on the active list of the navy appointed by the President, by and with the advice and consent of the Senate, from among the officers of the line of the navy not below the grade of captain for a period of four years, who shall, under the direction of the Secretary of the Navy, be charged with the operations of the fleet, and with the preparation and readiness of plans for its use in war: Provided, That if an officer of the grade of captain be appointed Chief of Naval Operations, he shall have the rank, title and emoluments of a rear admiral while holding that position.

Duties of Chief of Operations.—In defining the duties of the new Chief of Operations, the Secretary of the Navy made public the amendment of the regulations under which he will act. The new regulations are possible of several constructions, and not until the scheme has been in effect some time will the scope of his authority be determined. The Secretary indicated that the regulations will be subject to change and in a sense may be regarded as only tentative. They have the approval of

Admiral Dewey and Rear Admiral Fiske as well as of most of the officers on duty at the department. Admiral Fletcher, commander-in-chief of the Atlantic fleet, was consulted in forming the regulations, which are as follows:

NEW NAVY REGULATIONS GOVERNING OFFICE OF CHIEF OF OPERATIONS

SECTION 3. The Division of Operations of the Fleet. Article 126:

1. The Chief of Naval Operations shall, under the direction of the Secretary of the Navy, be charged with the operations of the fleet, and with the preparation and readiness of plans for its use in war. (Act of March 3, 1915.)

2. This shall include the direction of the Naval War College, the Office of Naval Intelligence, the Office of Target Practice and Engineering Competitions; the operations of the Radio Service and of other systems of communication, of the naval defence districts, and of the Coast Guard when operating with the navy; the direction of all strategic and tactical matters, organization, maneuvers, target practice, drills and exercises and of the training of the fleet for war, and the preparation, revision and enforcement of all tactics, drill books, signal codes and cipher codes. The orders issued by the Chief of Naval Operations in the performance of the duties enumerated in this paragraph shall be considered as emanating from the Secretary of the Navy and shall have full force and effect as such.

3. The Chief of Naval Operations shall be charged with the preparation, revision and record of regulations for the government of the navy, Naval Instructions and General Orders.

4. He shall advise the Secretary concerning the movements and operations of vessels of the navy and prepare all orders issued by the Secretary in regard thereto; and shall keep the records of service of all fleets, squadrons and ships.

5. He shall advise the Secretary in regard to the military features of all new ships and as to any proposed extensive alterations of a ship which will affect her military value, and all features which affect the military value of drydocks, including their location; also as to matters pertaining to fuel reservations and depots, the location of radio stations, reserves of ordnance and ammunition, fuel, stores and other supplies of whatsoever nature with a view to meeting effectively the demands of the fleet.

6. In preparing and maintaining in readiness plans for the use of the fleet in war, he shall freely consult with and have the advice and assistance of the various bureaus, boards and offices of the department, including the Marine Corps Headquarters, in matters coming under their cognizance. After the approval of any given war plans by the Secretary, it shall be the duty of the Chief of Naval Operations to assign to the bureaus, boards and offices such parts thereof as may be needed for the intelligent carrying out of their respective duties in regard to such plans.

7. The Chief of Naval Operations shall from time to time witness the operations of the fleet as an observer.

8. He shall have as senior assistant an officer not below the grade of captain.

9. He shall ex-officio be a member of the General Board.

10. During the temporary absence of the Secretary and the Assistant Secretary of the Navy, the Chief of Naval Operations shall be next in succession to act as Secretary of the Navy. (Act of March 3, 1915.)—*Army and Navy Journal*, 5/1.

ORDNANCE AND GUNNERY

SIXTEEN-INCH NAVAL GUNS.—The adoption of a 16-inch gun, mightier than any yet in use in the navy of any country, is foreshadowed for the United States Navy. At present the 15-inch gun of the British, German, Japanese, Russian and other foreign navies is the standard for the latest

type of superdreadnought. The United States Navy, following its traditional policy of having its ships, class for class, more heavily armed than those of foreign navies, proposes now to arm all future battleships with 16-inch batteries.

A new 16-inch gun has already been tested at the naval proving grounds at Indian Head, Md., and it is said to have given excellent results. In fact, the ordnance experts are said to be delighted with it. It was fabricated, with much secrecy, at the naval gun factory in Washington, D. C., and its tests also were conducted secretly. It is said to weigh about 100 tons, exclusive of course, of its mount. Its effective range is estimated at 15 miles.

One of the greatest achievements in the new American 16-inch gun is reported to be its durability. The life of the British 15-inch gun is said to be less than 100 shots, after which the erosion of the bore is such that accuracy is impossible. The Krupp factory in Germany has recently refused to guarantee a longer endurance than 250 shots for its greatest guns. But the difficulties arising from the erosion following the use of such tremendous charges as it will use are believed to have been overcome in the American 16-inch gun.

So pleased with it are the naval ordnance experts that it has been suggested that eight of the 16-inch be substituted for the twelve 14-inch designed for the new *California* class of battleships.—*Army and Navy News,* May.

A DEMAND FOR 16-INCH COAST-DEFENCE GUNS.—Before the *Queen Elizabeth* had done her surprising work in reducing the Dardanelles forts at 21,000 yards range, Brigadier General E. N. Weaver, Chief of Coast Artillery, had recommended the construction of 16-inch 50-caliber guns for the new fortifications at the entrance to the Chesapeake Bay. Such a piece would be superior to the 15-inch naval guns on every point of comparison. The Elswick 15-inch naval gun fires a 1925-pound shell with a muzzle velocity of 2500 feet per second and a muzzle energy of 83,425 foot tons. A coast defence 50-caliber 16-inch piece, firing a 2500-pound shell with equal velocity, would have a muzzle energy of well over 100,000 foot tons; moreover, because of the high degree of elevation which could be given, it would greatly outrange the 15-inch gun. In view of the extraordinary increase in fighting ranges developed during the war, it will be good policy to mount some 16-inch guns at all our existing defences, and particularly at Panama and in the Philippines.—*Scientific American,* 3/27.

As the result of exhaustive tests being made at the naval proving grounds at Indian Head, Md., it is unofficially reported in Washington that the two new dreadnoughts provided for in the Naval Bill passed at the last session of Congress will probably mount 16-inch guns, the largest and most powerful ever designed in this country. The rifles will have a diameter an inch greater than the guns of the British dreadnought *Queen Elizabeth,* which is armed with 15-inch guns.—*Army and Navy Journal,* 3/20.

THE NAVY 14-INCH GUN.—A proposition for equipping the battleships authorized by the Naval Appropriation Act with 16-inch guns is under consideration by the Navy General Board. While the proposed change has some enthusiastic advocates, it has by no means been decided to increase the size of the guns for the dreadnoughts. The change will make necessary a complete rearrangement of the turrets on the new battleships and some radical departures in their construction. It will be necessary to reduce the number of large guns on the ships from 12 to 8 and to abandon the 3-gun turret construction, which has just been perfected and is thought to have many advantages over the older arrangement of the guns.

Sometime ago the Navy Bureau of Ordnance prepared plans for a 16-inch gun, one of which has been built and tested. It was regarded as the most powerful navy gun in existence, and the Naval Gun Factory is fully

equipped to turn out the new type of gun on short notice. But some ordnance authorities do not believe a change from 14- to 16-inch guns would increase the efficiency of our battleships, it being necessary, in their opinion, in order to use a 16-inch gun on the battleships to decrease its muzzle velocity, and figures have been submitted to prove that the American ships armed with 14-inch guns are more than a match for the English dreadnoughts with 15-inch guns. Then it is urged that the range of a 14-inch gun goes to the limit of the control of the fire of a battleship, throwing projectiles as far as hits can be made under battle conditions. A battleship armed with 14-inch guns would have 12 chances to hit against eight chances with 16-inch guns, and one well-planted shot from a 14-inch gun in a vulnerable spot might put a battleship out of commission as readily as a 16-inch shot, so that it is not necessary to have a 16-inch gun to sink the largest and most powerfully armored ship afloat. The advocates of 16-inch guns claim, however, that these theories have been disproved by the European war, and are submitting some new data from a confidential source to prove their contention that the 16-inch guns should be adopted.

According to the Bethlehem Steel Company, as shown by figures given in the *New York Herald*, the principal characteristics of the 14-inch 45-caliber guns, as made by Bethlehem, are: Weight of gun, tons, 70.3; weight of projectile, pounds, 1400; muzzle velocity, foot seconds, 2600; muzzle energy, foot tons, 65,700; energy at 3000 yards, foot tons, 50,420; penetration of wrought iron (Gavre formula), inches, 56.4. The 15-inch Elswick 45-caliber gun possesses these characteristics: Weight of gun, tons, 98.6; weight of projectile, pounds, 1925; weight of cordite charge, pounds, 400; muzzle velocity, foot seconds, 2350; muzzle energy, foot tons, 83,425; penetration at muzzle of Tressider wrought iron plate, inches, 53.7; rounds per minute, 2.

There is some little variation from these figures in the guns built at the Vickers works. The Beardmore 15-inch gun is the shortest of the English made rifles and has a .42-caliber length as compared with .45-caliber length in the above pieces. The principal characteristics of the Beardmore gun are: Weight of gun, tons, 90; weight of projectile, pounds, 1850; muzzle velocity, foot seconds, 2350; remaining velocity at 5000 yards, foot seconds, 2187; remaining velocity at 10,000 yards, foot seconds, 1853.

The Navy Bureau of Ordnance, in its comparison of the types of guns, asserts that the 14-inch gun possesses equal power with the 15-inch gun to pierce armor plate at 16,000 yards, and somewhat further than that, which it considers the maximum practicable battle range. In fact, the range must be reduced away below that, it is said, before any accurate shooting can be done. —*Army and Navy Journal*, 5/1.

CALAIS TO DOVER EASY SHOT.—*Turpin Says Gun with Even Greater Range Has Long Been Possible.*—"Theoretically, there is no limit to the range of big guns," said Henry Turpin, the inventor of melinite and of the new explosive, "turpinite," to a representative of the *Petit Parisien* in discussing the bombardment of Dunkirk.

"When I was attached to the technical artillery section of the Ministry of War, General André, the Minister, asked me to make special experiments to see if it was possible to produce a gun and a projectile with a range equivalent to the distance from Calais to Dover. My first experiments and calculations showed it was possible to attain a much greater range than that."

It was while connected with the Ministry of War that M. Turpin invented the aerial torpedo, which the Germans appear to be using on both fronts, and the inventor is unable to understand how they learned the secret.—*N. Y. Times*, 5/5.

FACTS OF BIG GERMAN GUN.—*Takes Six Hours to Point it; Gunners Fire From 1000 Feet Back.*—What is asserted to be the first accurate information yet given out concerning the big German howitzers was issued by the German Information Service last night. It gave these details:

"Weight of gun, about 100 tons; weight of foundation plate, about 40 tons; length of gun barrel, 16½ feet; weight of projectile, 880 pounds; length of projectile, four feet; gun consists of 172 parts; necessary for transport, twelve railroad cars. The foundation plate on which the gun rests is incased in concrete at a depth of 26 feet.

"Liege was bombarded from a distance of 14¼ miles. The deviation from the exact range was not more than 20 inches. The first shot killed or wounded 1700 men; the second shot killed or wounded 2300 men. Namur and Maubeuge received each two shots. Fort Huy received one shot.

"It takes 25 to 26 hours to mount the gun; it takes six hours to point the gun after the exact range has been established by other guns. The gun is discharged from a distance of 1000 feet. Window panes will break in a radius of two and one-half miles. Each projectile costs $2750. The gun crew consists of 200 men.

"The cannoneers wear safety caps over mouth, eyes and ears and lie flat on the ground. Mines are planted under the gun, which the engineer is compelled to blow to pieces in case of danger."—*London Times*, 4/8.

POWER DEVELOPED IN CANNONS.—Monsieur le Commandant Regnault has calculated the actual horse-power developed during the firing of a projectile by some modern specimens of artillery. The results are truly astounding. In the case of a cannon of moderate size, projecting a projectile weighing 7 kilograms with an initial velocity of 500 meters, the deflagration of the explosive lasting about one hundredth of a second, we have, during that time, work done to the extent of 115,000 horse-power. For larger artillery, where the weight of the projectile reaches and surpasses 500 kilograms, the initial velocity being 900 meters, we have no less than 25 million horse-power developed during the explosion. These figures give an idea of the formidable efforts which the metal of modern pieces of artillery has to support.—*Scientific American*, 3/13.

THE OLD GUNS OF THE FLEET.—There was a tendency on the part of those who based their naval criticism on historical precedent to underestimate the power, range, and accuracy of the modern gun. It was frequently forgotten that naval artillery has undergone a complete revolution since rifled guns were introduced, and that consequently no useful deductions could be based upon the experience of the remote past. It is doubtful if even peace practices furnished a reliable guide. At any rate, it must now be apparent that any conclusions which were drawn from the gunfire of 50 or 60 years ago were ill-founded. The naval correspondent of *The Times* has recalled that the British ships at Algiers in 1816 closed to point-blank range. At Acre also, in 1840, the ships took up positions within 700 yards from the forts, and by a continuous storm of projectiles overwhelmed the defence. In those days the ships were at a disadvantage owing to the material of their construction, especially if red-hot shot were employed. In the attack on Sevastopol, in 1854, where the ships fought at anchor, and engaged at about 2000 yards, several vessels were set on fire by this means, and others by the explosion of shell. At the bombardment of Kinburn, in the following year, armored floating batteries were used by the French for the first time, but what these gained by protection they lost by the small number of guns they carried, and the place fell to the more numerous guns of the unarmored vessels. Even the conclusions which were based upon the Spanish-American War and the war between Japan and Russia left entirely out of account the progress which has since been made in the construction of naval guns and in fire control. When it was first suggested that ships would fire at long range, it was admitted that the results might not be

decisive, but that nevertheless ships would be chary of approaching nearer to one another than the range of more or less effective torpedo fire. It was only later that it was urged that, torpedo or no torpedo, an admiral, having the better armed ships, would chose to engage the enemy at such a range as would keep him beyond the effective fire of his opponent. Whatever may have been the reason uppermost in the minds of Sir Doveton Sturdee and Sir David Beatty, the fact remains they punished the enemy with the utmost severity without themselves suffering serious loss.—*Naval and Military Record*, 3/10.

TRINITROTOLUENE IN THE WAR.—In a recent article reference was made to the high explosives used as bursting charges for shells, the most important being the much-discussed trinitrotoluene, used largely by the Germans. The following is a summary, from *Nature*, of an able contribution on the subject, published in the *St. Thomas's Hospital Gazette* for December:

Few people realize the exacting conditions which a high explosive for shells must fulfill; these may be summarized as high bursting power, stability in storage, insensitiveness to shock on firing from the gun and on impact of the projectile, where it is desired that penetration shall precede bursting. Yet it must be possible to cause the material which withstands such drastic treatment to detonate when required with frightful violence. It is a case of reconciling the irreconcilable. Further points are safety in handling in the shell factory and the suitability for producing maximum density of loading, say by some such method as melting and pouring into the shell.

The brisance, or bursting power, is shown to depend on the potential energy of the explosive, the velocity of detonation, and the degree of concentration (density of loading).

It will be realized that few substances will fulfill such conditions, and the number will be still further reduced by difficulties and cost of manufacture. The paper discusses the four most important explosives which have been tried for this purpose, namely picric acid (lyddite), trinitrotoluene (TNT), tetranitromethylaniline (tetryl), and tetranitraniline.

The trinitrotoluene is the symmetrical isomer (1:2:4:6) melting at 80.6. It is manufactured by dissolving *ortho*nitrotoluene in concentrated sulphuric acid, nitrating first to the dinitro and finally to the trinitro stage, the purification being effected by recrystallization from ethyl alcohol containing a little benzine.

Data are given of comparative trials of TNT and picric acid, both in France and Germany. In velocity of detonation and with the lead block test (increase in size of cavity on firing a charge) the advantage is with lyddite, as the following figures demonstrate:

Velocity of detonation.....	7745	7140 meters per second.
Lead block test.....	228	218 cubic centimeter.

TNT caused, however, a greater displacement of earth than lyddite when fired in a bore-hole 1 meter deep.

Except in the last instance, picric acid held a decided advantage throughout, and the question at once arises: Why, then, has trinitrotoluene been adopted by Germany, Russia, Italy, and other countries in preference to the picric acid that is still mainly used by us under the name of lyddite, and by France under the name of melinite? The struggle between the two explosives has been long and of doubtful issue, but it has now probably ended in the victory of trinitrotoluol.

In furnishing the answer to this conundrum the writer continues:

We have seen it to be inferior in regard to power, velocity of detonation, and density of concentration; its advantages lie in its greater insensitiveness to shock, its freedom from poisonous dust and fumes, the much lower temperature at which it can be poured into shells, and its chemical indifference to substances like lead and iron which are liable to form dangerous

picrates. When firing a shell against a ship's armor, at certain limits of the thickness and toughness of the armor-plate and of the velocity of the shell's impact, picric acid would explode when trinitrotoluol would perform its work efficiently, and the latter is therefore better adapted to a high-velocity shell of large caliber.

Since TNT contains too small a percentage of oxygen for complete combustion, attempts to use it incorporated with bodies rich in oxygen, such as potassium chlorate, have been tried. The Belgian high explosive, "macarite," is stated to consist of 30 parts of TNT and 70 parts of lead nitrate. A very high density of loading is thus attained, but the velocity of detonation of macarite is given as only some 4600 meters a second.

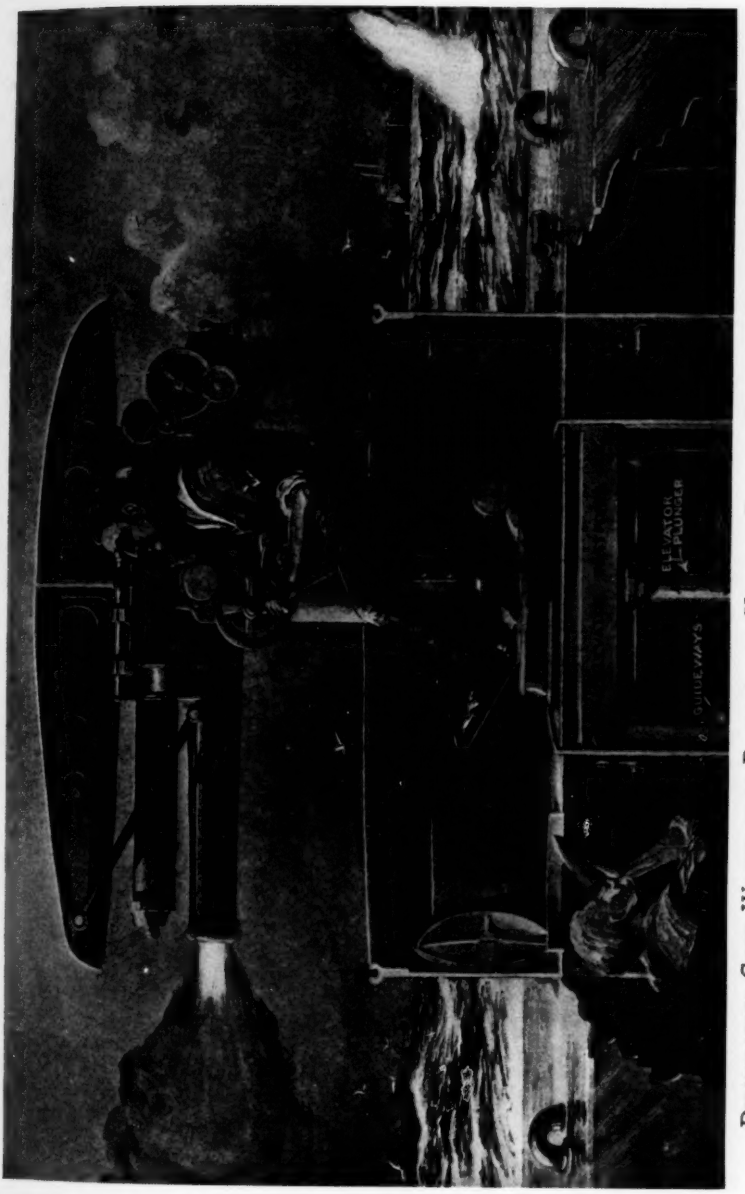
In concluding his article, the author says that tetranitraniline or tetryl seems to be the only known substance that may supersede trinitrotoluol.—*Scientific American Supplement*, 3/13.

SUBMARINE DISAPPEARING GUNS.—It is a matter of common report that the German submarines that figured prominently in the early months of the war were equipped with two sorts of guns. One a 37-millimeter weapon firing from a fixed pedestal mount a shell of 1½-inch caliber; and the other, a more formidable piece, arranged to disappear into the superstructure and to throw a 12-pound projectile. This gun is a stumpy, but powerful rifle, having a caliber of 2.95 inches, and at moderate range likely to prove an unpleasant antagonist for a torpedo-boat. But again this meant exposure for the gun's crew, for the men had to come out upon the deck in plain sight if the submarine were running light, as she would of necessity have to be, to measure forces in this fashion with a surface fighting craft. To get under suddenly, the deck hatch might have to be closed before the men at the gun could retreat into the submarine.

On the 29th of March the *Crown of Castile*, a British steamer, was sunk off the Scilly Islands by the German submarine *U 28*, and she was sent to the bottom, according to her crew, by shell fire. But this attack, so it is reported, was not made by 12-pound projectiles, but by shell of 4-inch caliber. The 4-inch gun fires a shot weighing in the neighborhood of 33 pounds, and surely this marks an important advance in artillery for submarines. The *Crown of Castile* tried to outdistance her pursuer and to zigzag away from torpedoes, but the German commander not only had superior speed to draw upon, but he had also a surprise in the shape of this newest of under-water-boat guns. Now this development confirms a rumor of recent months that the Kaiser's submarines were being supplied with bigger guns and that these weapons were installed in a novel manner, in fact, so mounted that they would not be continually exposed to the corrosive action of salt water when the craft were running submerged. Further, the arrangement was such that the gun crews did not have to stand upon the open deck.

We are able to illustrate, from a reliable source, the housing, gun and mount, which is said to be identical with that employed by the Germans in their very latest and largest *U* boats. It is quite manifest that the installation is a long stride forward in making the submarine more formidable and efficient, especially when used as a commerce destroyer or when called upon to put up a fight against the worst of her present foes, the high-speed sea-going torpedo-boats. More than that, the arrangement shelters the gun crews from aerial attack. The particular installation which we are able to show is that for a quick-firing 14-pounder, but the operative principles would be the same for heavier weapons, such as the 4-inch rifles which we are told some of the *U* boats now carry.

The gun, with its superposed recoil cylinder and sheltering hood, is mounted upon a revolving pedestal provided with seats for two operators —one controlling lateral movement and the other manipulating the elevating gear with his left hand and firing with his right. The revolving pedestal, in its turn, is supported by a plunger elevator functioned by



DISAPPEARING GUNS WHICH IT IS REPORTED ARE USED ON GERMAN COMMERCE-DESTROYING SUBMARINES

means of a pneumatic cylinder. The gun-hood is really the hatch cover, and when the weapon is lowered this cover is seated water-tight against a rubber gasket in the recess at the top of the hatch or barbette. The gun

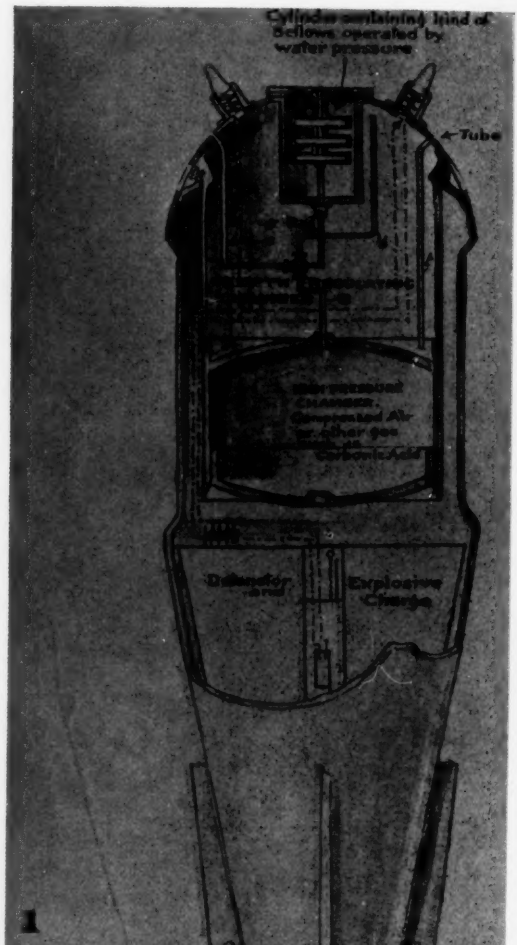


FIG. 1.—A Leon torpedo mine shown in section. The earlier form

pointers take their positions when the elevator is lowered, and rise with the rifle when the hatch cover lifts and the gun is cleared for action. The piece can be elevated and lowered in a few seconds.

It is perfectly plain that an installation of this character adds in fact and potentially much to the military powers of a submarine. Because guns of this sort can be worked in the semi-light trim a submarine need not expose so much of her hull or superstructure and, accordingly, should be able just so much quicker to seal up and disappear below the waves for greater security. It is equally evident that a disappearing mount of this nature can be housed beneath and within protecting armor of moderate thickness and a frontal shield set upon the gun, thereby greatly increasing the resistance against attack. In this we can see the first step in an evolutional line which will blaze the way to the still larger sea-going submarine with its upper works in mail.—*Scientific American*, 5/1.

THE LEON TORPEDO MINE.—The French battleship *Bouvet* was stated by the British Admiralty to have been "blown up by a drifting mine" in the Dardanelles; while H. M. S. *Irresistible*, "having probably struck a drifting mine," and H. M. S. *Ocean* "also having struck a mine, both vessels sank in deep water." It has since been reported, unofficially, that the type of drifting mine used by the Turks is believed to have been the Leon torpedo. Fig. 1 is the earlier of the two, patented in 1907. Fig. 2 represents its latest development. This mine was invented by Capt. Karl Oskar Leon of Karlskrona, Sweden. A torpedo mine is so called because it can be ejected from a tube like a torpedo. It does not, however, move horizontally like a torpedo by its own power, but it can be set to oscillate more or less vertically beneath the surface at any desired depth. In the type shown in Fig. 1, the oscillating mechanism is regulated by means of compressed air in a chamber within the mine. The bellows are extended by increase of water pressure and contracted by its decrease. Water is admitted to the depth regulating chamber and expelled from it through the tube *t*, which communicates with the water surrounding the mine. The explosion of the mine is caused by impact with the two spring-pressed horns seen projecting at the top of Fig. 1. The mine shown in Fig. 2 floats almost vertically in the water. It sinks to a certain prearranged depth at which the propeller is automatically actuated to drive it up again. The action of the propeller can be made to begin and cease at any depth desired. The time during which the mine is to float can also be regulated. (*Drawings copyrighted in the United States and Canada.*)—*Scientific American*, 5/1.

TURKISH GUNS IN EGYPT.—Nothing caused greater surprise and admiration in the measures taken by the Turko-German force for the recent attack upon the Suez Canal, than the manner in which certain guns of really large caliber were transported across the desert, being successfully withdrawn when the attack proved abortive. It is now stated that a wounded Turk, taken prisoner by the Anglo-Egyptian force, has supplied the clue, and that three years ago the Germans, the thoroughness of whose preparations we all respectfully admit, buried these big guns in the desert close to the positions which lately they took up, and that they were reinterred when the attack was found to have failed. It is also said that a traction engine was employed to drag these guns from their place of sepulchre to that where they came into action, the gun carriages being furnished with three wheels, each about 18 inches wide, one of these being under the trail of the gun. Search is, we understand, being made for these guns, and already a considerable amount of shrapnel shells have been found buried in the sand dunes of the desert.—*Army and Navy Gazette*, 4/24.

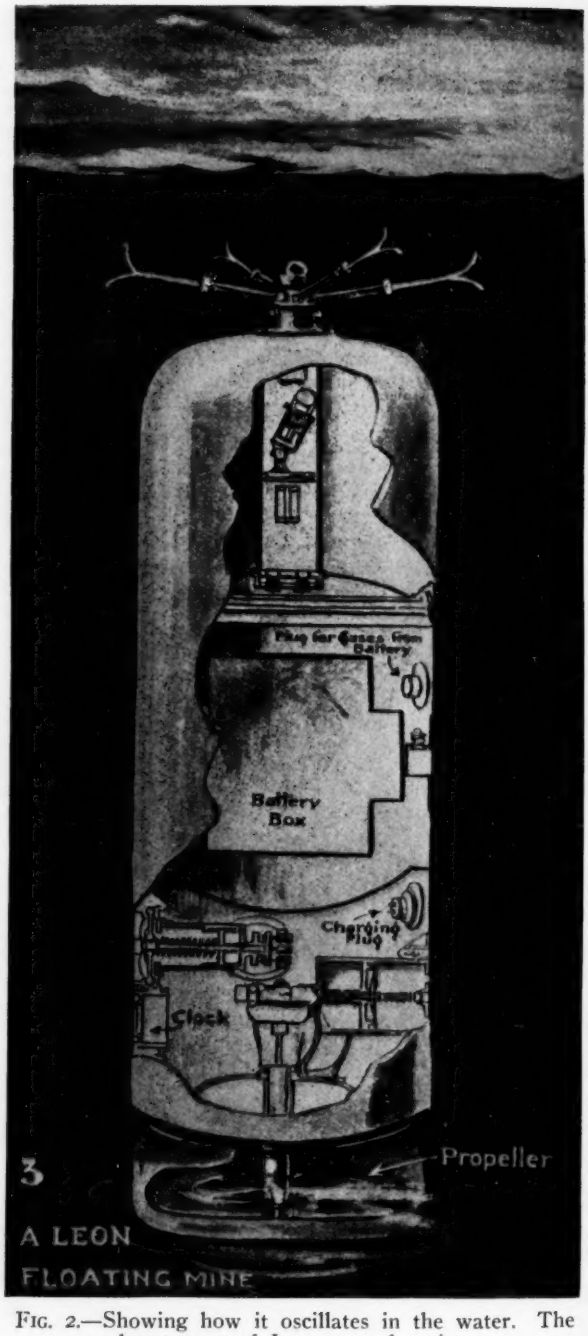


FIG. 2.—Showing how it oscillates in the water. The latest type of Leon torpedo mine.

HELMET TO STOP SHRAPNEL.—*Proposed Headpiece for French Weighs 28 Ounces.*—It has been noticed for some time that the French soldier's kepi did not protect him from small splinters of shrapnel. A conservative spirit has so far prevented those in authority from changing anything in the historic headpiece.

In this war, however, sentiment must give way to utility, and an effort has been made to find a suitable helmet. One just proposed to the military authorities is made all in one piece, so as to protect the head, back of the neck and temples. The whole thing weighs 800 grams (about 28 ounces), which seems at first sight much too heavy.—*New York Times,* 5/5.

THE "ELECTRIC DOG" AND POSSIBILITIES OF TORPEDO CONTROL BY BEAMS OF LIGHT.—The possibility of equipping torpedoes with directive mechanism which would automatically cause them to be steered toward—and to follow and sink—battleships or other hostile vessels from which searchlamps were being operated has been suggested by the "electric dog" and other applications of selenium cells sensitive to light intensity demonstrated by Mr. B. F. Meissner, a student of electrical engineering at Purdue University, Lafayette, Ind., before several recent meetings of electrical men in the West.

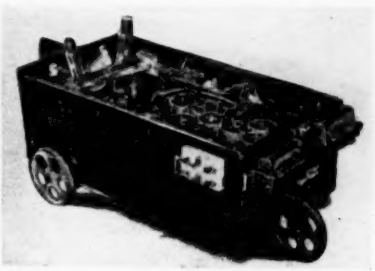


FIG. 1.—Mechanism of the "dog," showing selenium cells, batteries, steering magnets, etc.

By means of a small hand flashlamp directed at the "dog's" "eyes" (lenses behind which are mounted selenium control cells), the speaker caused the curious box on wheels to follow him about the stage, turning corners and avoiding chairs with no other control than that of the beam of light. By reversing a switch on the "dog" the mechanism was similarly made to back away from the source of light. The "dog" in each case started into motion quickly when the light was thrown onto its lenses and stopped just as promptly when the lamp was extinguished or turned away.

Storage cells inside the case furnish energy to drive the motor which propels the dog. Each of the selenium cells behind the eye lenses controls a relay which actuates the motor and one of the two steering magnets at the rear of the device. Illuminating a cell on one side starts the motor and turns the rear wheel to that side; illuminating both cells equally causes the mechanism to run straight forward. Thus the action of the control mechanism is to keep the two lenses always equally illuminated and pointed at the source of light—in whatever direction that source moves. The idea of the light-controlled "dog," it is explained, was suggested by Mr. John Hays Hammond, Jr., and the mechanism shown was worked out by Mr. Meissner. It has been proposed that torpedoes and submarines be equipped with directive mechanism of this kind which would cause them to follow and destroy any battleship which was using her searchlamps to sweep the seas in an effort to detect approaching craft. However she might be maneuvering,

such a vessel would have little chance of escaping her unknown menace, except by extinguishing her searchlamps. Indeed, in a sea filled with selenium-controlled torpedoes, searchlamps of any kind would be sources of hazard rather than protection.

Other experiments shown by Mr. Meissner included the ringing of bells, extinguishing of lamps, firing of a revolver, etc., by a beam of light from a distant arc.

In closing, the speaker showed the electric "thief catcher," which is actuated by the light of the supposed burglar's hand lantern. At the slightest illumination of the sensitive cell by the rays from the marauder's flashlamp an alarm was sent in and a bell set ringing, a revolver began firing, and a flashlight powder was set off, taking the burglar's photograph. Mr.

FIG. 2.—The "electric dog" follows the flashlamp in its master's hand

Meissner has suggested that the directive mechanism employed in the "dog" might be applied to the aiming of the revolver, thus leaving the robber no chance of escape.—*Electrical World*, 5/1.

ENGINEERING

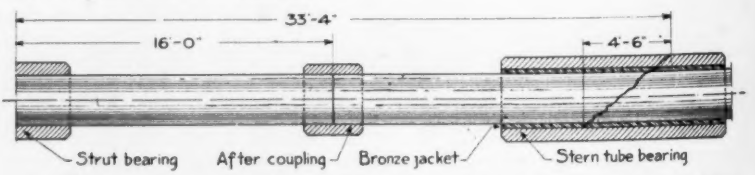
NOTES ON BROKEN TUBE SHAFT, U. S. S. "CONNECTICUT"

(Prepared by Naval Constructor E. G. Land)

GENERAL STATEMENT

1. Stern tube shaft broken about 4.04 p. m., March 13, 1915, while approaching anchorage in Guantanamo Bay. There was no evidence to indicate that outside influences caused the breaking of the shaft.

2. Fracture *about* as follows:



About 7½° right rudder was carried for 10 days prior to the accident, this not being normal.

All lignum vitae strips are torn out of stern tube as far as diver could reach; also torn out of strut bearings. The stern tube bronze jacket was broken with the shaft; the shafting aft of break moved aft about 16 feet, the outboard coupling bringing up against forward edge of strut. The tips of all three blades of propeller are bent; a few small sections of tips are broken off by contact with rudder (I examined the propeller on March 15). The rudder has five scratch marks or indentations on it, made by propeller tips. The rudder is practically undamaged (I examined rudder and hull on March 16). The hull is undamaged as far as could be ascertained.

3. It is understood that ships of the *Connecticut* class have a critical speed at which the vibration of the ship, the engines and the shafts apparently synchronize, causing excessive stresses and vibrations.

GENERAL NOTES

Shaft parted March 13, 1915, while entering Guantanamo Bay. Broke in the stern tube (outer tube bearing); break-spiral about 48 inches long—stern tube bronze jacket also broken—coupling of tube shaft and tail shaft brought up against the strut where it hung; tips of blades of starboard propeller broken on contact with rudder; rudder has five scratches in it but no damage of consequence; hull not damaged.

PROPOSITION

(a) To replace shaft in tube, fitting broken parts as nearly together as practicable.

(b) To secure shaft and propeller by lashing the propeller to the strut and both strut and propeller to the forward and after 8-inch barbettes; also a lashing to the mooring iron. *Connecticut* to go to home yard under one port engine, dragging starboard propeller secured as above; to be convoyed by *Orion*.

EQUIPMENT AVAILABLE

One 10-ton floating derrick from naval station (Alpha). Chain slings (1¼ inches); wire and manila hawser, straps, blocks, tackles, etc., from *Connecticut;* 33-foot sailing launch; eight divers and diving equipment for four of them; four diving pumps; after deck winches and other ship equipment as necessary; steadying lines; hogging lines and balancing lines.

PERSONNEL

In general charge, Commander I. C. Wettengel; in charge of diving and under water work, Gunner C. L. Tibbals; in charge of deck tackles, etc., Chief Boatswain Nels Drake.

OPERATIONS

Floating derrick placed on the starboard quarter. 33-foot sailing launch across the stern from *Connecticut* to derrick.

Saturday, March 13. Divers reported the condition of the shaft and general outline of the break.

Sunday, March 14. Succeeded in hauling shaft forward about 2 feet.

Monday, March 15. Hauled shaft forward about 3 feet 5 inches.

Tuesday, March 16. Hauled shaft forward about 4 feet. Propeller was turned to get fair lead for shaft. This required several efforts as the blades had a tendency to turn to a point not satisfactory for a fair lead.

Wednesday, March 17. Turned propellers and secured them; hauled shaft forward 2 inches until the strut bearing jammed the shaft's strut shoulder.

Thursday, March 18. Entered shaft in stern tubing and got about 19 inches in the tube when it jammed. Lines were passed under the ship to obtain proper lead of shaft.

Friday, March 19. Hauled shaft forward about 24 inches which appeared to be as far as practicable to get it. It was estimated that it was about 4 inches from being "well home."

Saturday, March 20. Secured chain lashing on propeller and strut and passed lines to forward and after 8-inch barbettes.

Sunday a. m., March 21. Finished securing shaft and propeller for trip north.

DIFFICULTIES

(a) Projection caused by stern tube bronze jacket.
(b) Projection of strut shoulder and strut bearing.
(c) Weight of shaft and propeller.
(d) Poor leads for tackles, etc.
(e) Necessity of giving shaft a fixed position to get a suitable bearing in stern tube in order that a fair lead might be obtained to haul shaft forward.
(f) Working under water, which was frequently anything but clear, due to the water in the bay being stirred up by the fleet.

The magnitude of the job and the difficulties encountered can only be appreciated by considering the number of men employed on the work and the amount of time consumed. Eight days were taken for the work which was started in the morning watch and continued as long as practicable.

Suggested means of doing the work another way:

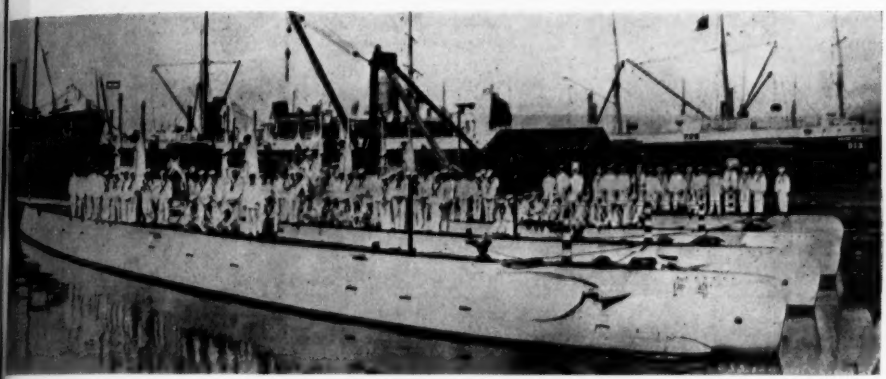
(a) Cut tail shaft and remove broken part (after end) of tube shaft and coupling from strut from forward side; propeller and cut tail shaft from after side.
(b) Cut strut and remove broken tube shaft, tail shaft and propeller.
(c) Remove propeller blades.
(d) Uncouple tail shaft from the tube shaft.
(e) Do either (a) or (b) by dynamite ribbon.

The method followed was considered more practicable than any of the above.

SEARCHING FOR CONTRABAND WITH X-RAYS.—When mention is made of Roentgen rays in connection with the present war, we are apt to think first of their use in hospitals to locate bullets, fractures, dislocations, etc., and this is quite natural because there is no doubt that many lives have been saved and much suffering has been avoided by the use of these penetrating rays. But it is not only in the hospital that we find this discovery of Professor Roentgen put to practical service. The fighting nations are very particular to keep from entering the territory of the enemy any goods that might be used in military service. This entails the endless task of examining all shipments, and the value of any means of seeing through a parcel or bulky package instead of opening it up and examining it in detail is clearly evident. Even in times of peace X-rays were used to examine packages which might contain dutiable goods. Naturally in time of war this method of examination has proved even more important. One of the most difficult of shipments to examine is that of the cotton bale, which obviously cannot be opened and thoroughly inspected and then restored to its original proportions without special baling machinery. What more simple, then, to pass Roentgen rays through it, and by means of a fluoroscope note whether the bale contains any foreign substances? Anything more dense than cotton would be shown up as a silhouette on the fluorescent screen. Even in this country cargoes are X-rayed before being accepted on British ships. Not long ago we illustrated the apparatus used in New York by representatives of the British Government. The value of such a search was demonstrated in one case by the discovery of four pounds of rubber sheeting in each of

178 bales of cotton waste. Needless to say, the consignment was refused.—*Scientific American*, 4/10.

EDISON BATTERIES FOR SUBMARINES.—The disabling of the submarine *F 4* in Honolulu Harbor, the cause of which at present writing has not been ascertained, has led to the surmise that some trouble might have been experienced with the batteries. Should sea water have come into contact with the sulphuric acid of the batteries, chlorine gas would have been generated. Of course sulphuric acid is not the only electrolyte that need be used in storage batteries. The Edison battery, for instance, uses a potash solution which gives off no poisonous gases when coming into contact with sea water. Public interest in the Edison cell has been aroused particularly by the fact that the new submarine *L 8*, which was recently launched, is equipped with this type of battery.—*Scientific American*, 5/1.



HAWAII'S LITTLE FLEET OF SUBMARINES

In the foreground is the ill-fated *F 4*, which went to her doom with all hands aboard. The crew, all of whom died, is seen on the deck of the under-water craft. The *F 4* has been located but efforts at salving have, as yet, failed. Therefore, definite information respecting the causes and circumstances of the accident are not yet available.

TRAPS FOR SUBMARINES.—A German submarine, according to a despatch from London the first of this week, became securely entangled in a net especially designed for that purpose and stationed off Dover. Miles of submarine traps, not unlike gill nets used by fishermen, have been set by the British Navy at harbor entrances and other strategic points around the British Isles. These consist of malleable iron frames 10 feet square and sunk to a depth of 30 feet suspended by buoys; if a submarine enters one of these traps its sides are caught and the under water craft is then in the position of a fish floundering in a net.—*Marine Journal*, 4/10.

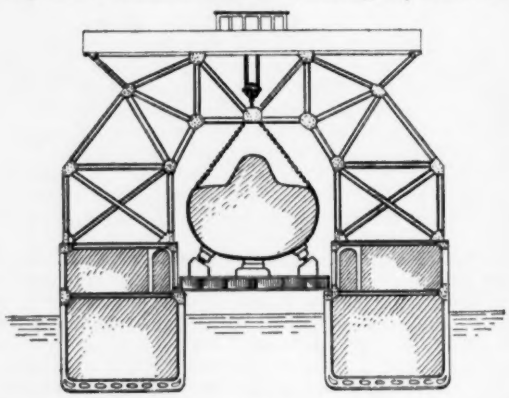
SUBMERGIBLE SUBMARINE SUPPLY BOAT.—Simon Lake writing in the *New York Sun* on "Inventive and Constructive Submarines," undertakes to show how a submarine can be made capable of sinking to the sea bed and there, beyond the reach of its foes, of drawing new strength, so to speak, from a suitably designed submergible submarine supply boat. The submarine could rise during the night to the surface to take in fresh air, fill up pressure tanks and to recharge her storage batteries, and boats seeking submarines after dark would have a task cut out for them pretty much like that of hunting for the proverbial needle in a haystack.—*Army and Navy Journal*, 4/3.

ACCIDENTS TO SUBMARINES OF THE NAVIES OF THE WORLD

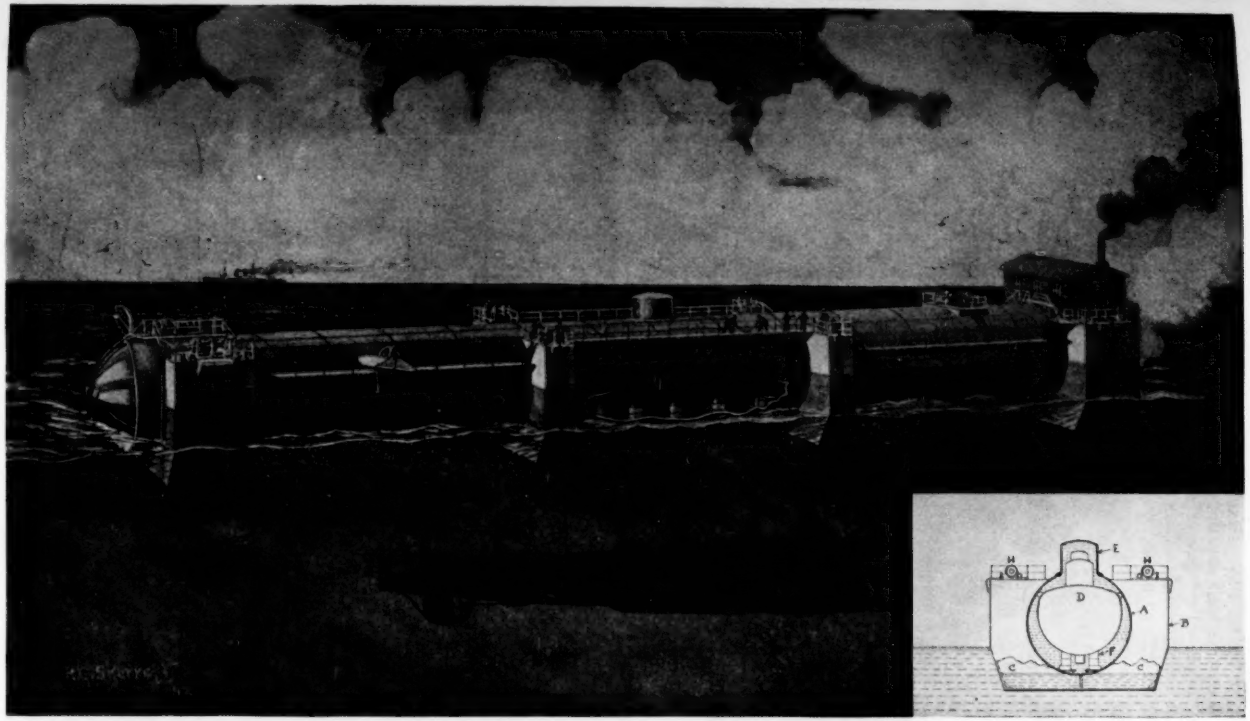
Vessel and Place	Dead	Date
The Farfardet (French), Tunis	12	1905
The A 5 (British), Queenstown	4	1905
The A 4 (British), Portsmouth	0	1905
The Lutin (French), Tunis	15	1906
The A 8 (British), Plymouth	15	1906
The Algerien (French), Cherbourg	0	1907
The X (French), Cherbourg	0	1907
The Gymnote (French), Toulon	0	1907
The Grampus (United States), Norfolk	1	1908
The Foca (Italian), Naples	8	1909
The Kambala (Russian), Sebastopol	20	1909
The Dragon (Russian), Petrograd	1	1909
The C 11 (British), Cromer	13	1909
The No. 6 (Japanese), Hiroshima Bay	14	1910
The Pluviose (French), Channel	27	1910
The U 3 (German), Kiel	0	1911
The Loutre (French), La Palice	0	1911
The A 3 (British), Portsmouth	14	1912
The Vendemiaire (French), Cherbourg	23	1912
The B 2 (British), Kentish coast	15	1913
The Foucault (French), Cherbourg	0	1913
The E 5 (British), Milford Haven	0	1913
Swedish submarine, Stockholm	0	1913
The C 14 (British), Plymouth	0	1913
The A 7 (British), Plymouth	11	1914
The Iquique (Chilian), Bellingham Bay	0	1914
The C 2 (British), Harwich	0	1914
The Calypso (French), Toulon	0	1914
The F 4 (United States), Honolulu	26	1915

—*N. Y. Herald, 3/27.*

SALVING SUNKEN SUBMARINES.—Germany was the first country to recognize the dangers and requirements of sub-surface navigation, and, anticipating the very kind of accident that has befallen our *F 4*, as long ago as 1910 built a special vessel for the salvage of submarines, and also arranged it in such a way that it could be used as a floating dry dock for repair work



CROSS-SECTION OF THE GERMAN SALVAGE SHIP, SHOWING A SUBMARINE LIFTED BY THE GANTRY CRANE AND PLACED UPON THE REMOVABLE FLOOR OF THE DOCK



ITALIAN SALVAGE VESSEL AND TESTING DOCK FOR SUBMARINES

Length over all, 235 feet; length available inside, 213 feet; internal diameter of pressure tube, 23 feet; displacement, loaded, 925 tons; displacement, light, 500 tons. *A*, pressure tube; *B*, caissons; *C*, water ballast; *D*, submarine; *E*, pressure hood for conning-tower; *F*, keel blocks; *H*, electric winches.

on these craft. This vessel is a powerful self-propelled craft 230 feet long with a double hull arranged to operate in the same manner as an ordinary lifting dock. Two powerful gantry cranes provide a lifting power capable of handling a weight of 500 tons, and with its tackles hooked to chain slings,

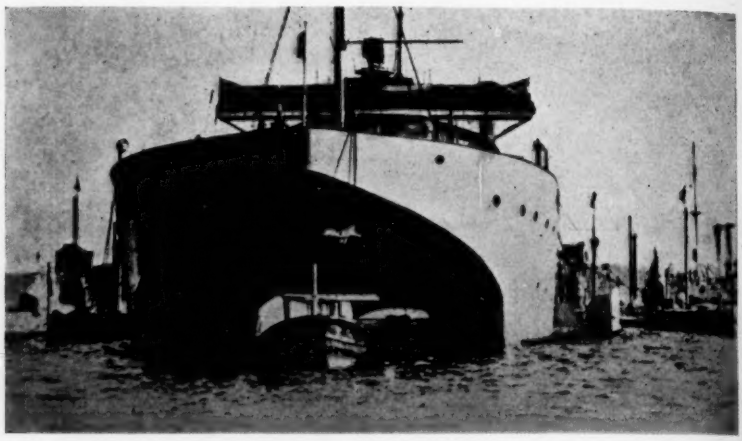


FIG. 1.—The German salvage vessel *Vulkan* can lift 500 tons 25 meters in an hour

or to strong ring bolts built into the hull of a submarine, any submarine boat can be drawn up at a speed of about 80 feet a minute. Inside the pontoon hulls, and at a suitable height above the water-line, shelves are

FIG. 2.—Bow view of French salvage vessel for submarines

provided which will support a removable dock floor that enables work to be done on a submarine after it has been lifted clear of the water. Ths mobile dry dock has undoubtedly been of great value during the present hostilities.

Italy has also provided a special craft as an auxiliary to submarine work, but it is rather more in the nature of a testing device than as a rescue apparatus, although it is better adapted for this work than the ordinary marine derrick, and it can also be utilized as a floating repair dock.

As will be seen in one of the accompanying illustrations the *Laurenti*, which is the name of the Italian device, consists fudamentally of a long steel tube *A*, capable of withstanding high pressures exerted from within, into which a submarine *D* can be floated and secured, after which the entrance is hermetically sealed. In our picture, the gateway is shown on the left sealed by the convex caisson. The pressure tube is supported by ballast tanks *B*, which can be filled with water ballast *C* or exhausted as occasion requires. The dock has its own power plant and its own pumping equipment. A removable hood *E* provides a housing for the conning-tower. The tube is supplied with keel blocks *F*, and electrically-driven capstans

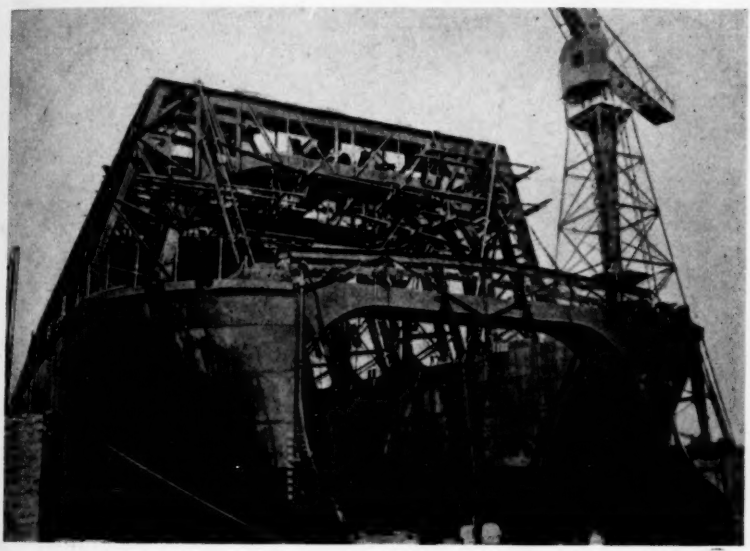


FIG. 3.—Stern of French salvage vessel, showing catamaran arrangement of the two hulls

H H. When the submarine is held within the dock and surrounded by water filling the tube, as shown by the small diagram, pressure is exerted upon the enveloping water by a suitable steam pump, and this pressure can be raised greatly in excess of the hydrostatic pressure to which a submarine would be likely to be subjected voluntarily. Observers remain in the submarine while undergoing this pressure trial, and telephonic facilities keep them in touch with those in charge of the dock and the pumping plant. In this way the inspection can be carried on deliberately and exhaustively, and all of the operative mechanisms can be put in motion and tried under physical conditions truly reproducing the circumstances of actual deep submergence. There is no hazard involved, and the whole operation can be conducted right at the yard.

Our illustration also shows how the *Laurenti* dock can be used as a salvage apparatus. In this manner a sunken submarine can be raised and carried into port or borne to shallow water, where she can be opened and

entered if such an operation be desirable. In addition to being a testing dock, the *Laurenti* submarine auxiliary can also be employed as an ordinary floating dock for under-water boats, and in our picture the plating is removed amidships to show a submarine resting inside.

France also long ago provided for the necessities of its submarine flotilla by building a vessel very similar in general design to the German ship, but of greater capacity and about double the lifting power of the latter, and an excellent idea of its construction can be had from our illustrations.

The permanence of the submarine, both as an instrument of offence and defence, has been definitely settled the last few months, and, reading between the lines of published reports of the doings of the German craft, there is not the slightest doubt but that auxiliary vessels of the general

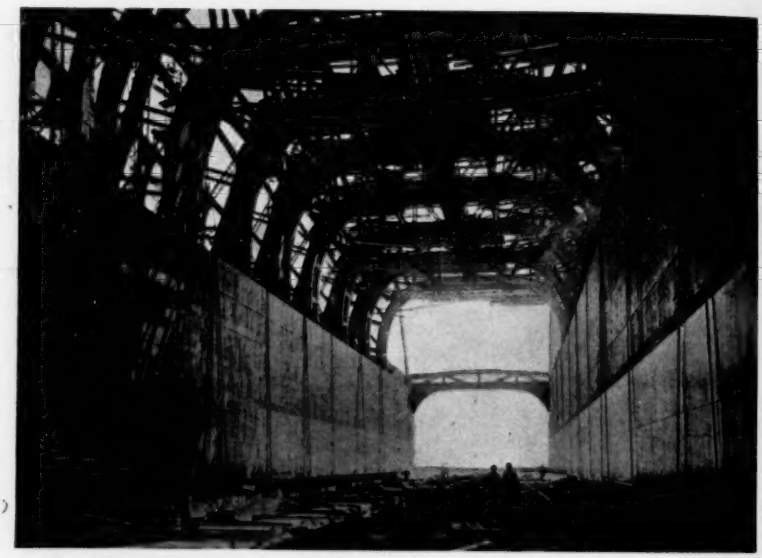


FIG. 4.—View between the hulls of the French salvage vessel. Displacement, 2300 tons; length, 322 feet. Can lift 1000 tons from a depth of 120 feet

character of those here described are absolutely essential to the successful prosecution of submarine enterprises; and with these facts so plainly demonstrated, and made emphatic by our present disaster, our Government should lose no time in taking steps in this direction, for at present the United States possesses absolutely nothing of this description.

AERONAUTICS

EXPLOSIVE DARTS AGAINST ZEPPELINS.—R. F. Robertson, of Dublin, Ireland, has just perfected an invention designed for the destruction of Zeppelin balloons by aeroplanes. He is said to have received a large order from the French and British army departments. The invention consists of a steel dart, fitted at its rear with fishhook-like projections. The dart is hollow and contains an explosive which burns with a fierce sharp flame. When such a dart is dropped from an aeroplane upon a Zeppelin or other

gas balloon, the hooks catch in the fabric after the point of the dart has pierced it and the explosive charge it ignited by the pulling backward of a friction detonator. As the explosion takes place inside the gasbag its effects are expected to be disastrous.—*Scientific American*, 3/13.

SPERRY EXPERIMENTS WITH HIS STABILIZER.—Lawrence Sperry has lately been experimenting with his automatic flying boat around New York, and among other things has tested the automatic volplane device in connection with the gyroscope control. It is reported that this is a small instrument resembling a windmill, which acts upon an electric switch, putting into action the auxiliary motor that works the controls. The action obtains only when the windmill's speed is reduced through the slowing of the aeroplane by engine stoppage or other cause when the elevator is operated to head the craft downward. A curious accident occurred during one flight, when a small sheet copper patch on the propeller loosened and was shot through the hull of the boat, causing a leak.—*Scientific American*, 3/13.

EIGHT-CYLINDER MOTORS EXPORTED.—How quickly the American 8-cylinder gasoline motor has forced its way to the front, is plainly shown by the fact that one of the latest types of this motor is used in certain hydro-aeroplanes, which have been ordered by the Allied governments. The motor in question is the Hershell-Spillman engine, which is being used in at least two of the 1915 models of motor cars. Its flexibility, power and lightness have served to draw attention to it as a probable motor for aeroplanes and hydro-aeroplanes. It is reported that the German government has lodged an official protest against the manufacture and export of these motors to the Allies. The protest was disallowed, and the motors are now being installed in hydro-aeroplanes at Hammondsport, N. Y.—*Scientific American*, 3/13.

FIVE THOUSAND DOLLARS FOR ARMY AND NAVY AIRMEN.—When Glenn H. Curtiss took part in competitions he found that trophies were great incentives to good work, and to promote healthy emulation and to aid in the development of aeronautics in the army and navy he has not only offered a trophy worth $5000, to be competed for annually, but will give five purses of $1000 each to those accomplishing the best results. These prizes are offered through the Aero Club of America, and the rules of the contest will be arranged by a committee composed of members of the club and of the army and navy. That some encouragement is due to the progressive men in the government service will be appreciated when it is pointed out that the appropriations made for aeronautics for the coming year by the United States Government will not permit of the maintenance of more aeroplanes than Montenegro or Turkey has.—*Scientific American*, 3/13.

NEW MODEL DIRIGIBLE BALLOON HAS MEANS OF CLOSING BULLET PUNCTURES WITHOUT HALTING ITS FLIGHT.—When officials of the Navy Department to-day opened the bids for two dirigible balloons which are to be added to the navy's air fleet they found offered a new type of airship which has a way of closing, while in flight, punctures made by rifle and shrapnel fire. This is accomplished by a double envelope arrangement which may be shifted to cover any hole which may develop, the inside envelope being shoved over the hole and the outside envelope covering the hole in the inside envelope.

Israel Ludlow, president of the American Dirigible Balloon Syndicate, Inc., of New York City, explained the contrivance to Franklin Roosevelt, Assistant Secretary of the Navy. His concern submitted two bids—one according to the specifications of the Navy Department and another one which provides for the closing device and exceeds the department's specifications as regards speed and other features.

There were three bidders. The Connecticut Air Craft Company, of New Haven, submitted the lowest bid on three airships. They offered one dirigible balloon for $45,636.25 and asked $82,215.12 for two, with a reduction of $1000 on each if the tests, trials and acceptance take place near New York City, instead of at the Navy Aeronautical Station, at Pensacola, Fla. The American Dirigible Balloon Syndicate, Inc., offered to build one balloon for $41,000, and the Goodyear Rubber Company, of Akron, Ohio, offered to build one for $200,000. The Akron company put in an alternative bid of cost plus fifty per cent if not tested.

The American Dirigible Balloon Syndicate, Inc., offered to build the advanced model for $45,000. Besides the method of closing holes, the airship would be 208 feet long, instead of 175 feet, as required; its speed would be 30 miles an hour, instead of 25 miles, and it would have a full speed duration of three hours, instead of two hours. There also would be other features.

On the bid bond of the syndicate appeared the names of Hamilton Fish, Jr., and Allan Corey, of New York City.—*N. Y. Herald*, 4/21.

FIRING BETWEEN PROPELLER BLADES.—A year ago—on April 11, 1914—the *Scientific American* illustrated a machine gun firing over the tractor screw on a monoplane. A German patent has recently been issued describing a means of shooting through the disk area of a propeller. The trigger of the gun is geared to the engine so that when a blade is in the line of fire a lock prevents the gun from being operated. Roland Garros is said to have chased and brought down two Tauben recently by firing between his propeller blades. The difficulty of the operation may be judged by the fact that the normal speed of a Gnôme motor is 1200 revolutions per minute. The builder of the Heinrich biplane also proposes to arm the machine with a gun firing between the blades of the tractor screw.—*Scientific American*, 5/1.

TWO HUNDRED HORSE-POWER ANZANI MOTOR.—The latest Anzani motor is one of the most powerful that is in use for aeroplane work. It has 20 cylinders grouped around a circular crankcase, cylinder bore 4.2 inch and stroke 5.8 inch. Speed is 1250 revolutions per minute. On this type there are used four groups of five cylinders, all cylinders being of the same size. On the barrel-shaped crankcase each group is spaced along so that the cylinders are staggered with reference to the other groups, but viewed from the front, the effect is a star with 10 fore cylinders and 10 rear cylinders, while the side view shows each of the four groups lying in a somewhat different plane. Two cranks are used on the shaft, No. 1 being operated by all the rods of 10 cylinders and No. 2 by the remainder. Weight of the Anzani motor is 682 pounds.—*Scientific American*, 5/1.

STABILIZING APPARATUS FOR FLYING MACHINE.—An automatic stabilizing apparatus, particularly of that class in which a pendulum is provided is shown in a patent No. 1,132,503, to O. Wittokowski of Dusseldorf, Germany, the object being to provide an apparatus which will not be injuriously affected by the inertia of the pendulum when the flying machine changes its velocity. In doing this the pendulum, which is designed for stabilizing the flying machine in a longitudinal direction, is provided with a plane or planes which have a rocking support on a transverse axis and are so connected with the body of the flying machine that they are set, when the body is inclined at a certain angle, at a corresponding angle in order that in each position of the body the forces acting on the same are at an equilibrium, such forces being the pull of the propeller and the resistance of the front faces of the body of the machine and the pendulum. Thus in operation the air resistance of the pendulum is varied according to the inclination of the body to the direction of flight.—*Scientific American*, 5/1.

GERMAN ZEPPELINS.—*The Possibility of a Raid on England.*—It is known from an infinity of sources, *and on this subject there can be no possible doubt,* the Zeppelin works have built a Zeppelin every three weeks. Those who are astonished at this figure should remember that in 1913 eight Zeppelins were constructed (Nos. *15* to *22*), which works out at one every six weeks, and that in May, 1914, there were opened at Potsdam works intended to double the output of those at Friedrichshafen.

The Zeppelin works have, therefore, actually constructed eight or nine dirigibles of new type since the outbreak of war. This makes a grand total of *22* units, of which 13 have a capacity of from *22,000* to *27,000* cubic meters, the other nine remaining as above.

How many of them have been destroyed, and of what capacity were those destroyed? It is possible to ascertain the *certain* destruction of five Zeppelins: two in Russia (Warsaw and Libau), one at Dusseldorf, one at Badonvilliers, one at Friedrichshafen. It is *possible* that five others have also been destroyed: one at Metz, one at Cuxhaven, a second one at Friedrichshafen, and two seen by our aviators stranded in the Ardennes in the month of August. There are besides *probable* accidents in the interior of Germany. For the rest we have no certainty.

There remain, then, at the most 17 Zeppelins, at least 10, and probably 12 to 15, and it is not possible to ascertain how many of these can be counted as modern types of *22,000* and *27,000* cubic meters capacity, and 156 to 158 meters in length.

It is possible to state the certain destruction of two of the 13 indicated above, that at Badonvilliers (*Z VIII*) and the one in course of construction at Friedrichshafen. The crew of 30 of the first unit destroyed by the Russians indicates a third one as almost certain. There remain then at the most, 11 Zeppelins capable of undertaking the expedition in question, and at least six, say, generally speaking, eight or nine. We find, then, that there are in existence and suitable for the raid which formed the object of this study, six to 11 dirigibles of from *22,000* to *27,000* cubic meters capacity and of 156 to 158 meters length, 14.60 meters and 16.58 meters diameter, with four screws grouped in two pairs on two *nacelles* in the axis of the keel and with central cabin. They have a mean speed of 60 kilometers per hour and a maximum speed of *72* kilometers per hour, and can travel with a load of 600 to 1000 kilogrammes of explosives at a height of from 1500 to *2000* meters, according to the weather. Here we have, then, all the figures of the great adventure.

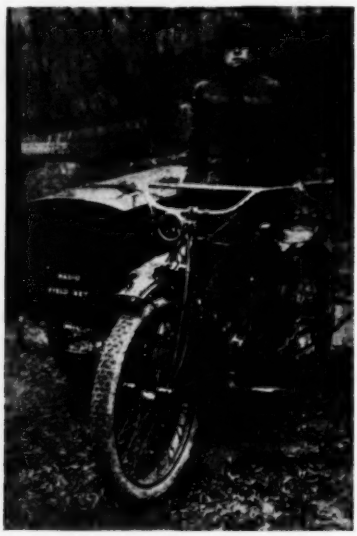
There is nothing very dreadful in it, especially if we consider the material impossibility of grouping them from the start for a collective raid, the absolute impossibility for them of arriving together when starting from different points, as before stated, and the no less absolute impossibility of successive attacks, once the adversary has been warned by the first dropping of bombs.—*Scientific American Supplement,* 4/3.

RADIO

RADIO TELEPHONE AND TELEGRAPH EQUIPMENT ON A MOTORCYCLE.—A motorcycle radio telephone and telegraph set has recently been devised by a New York inventor for use by armies on the march or in the field. The equipment is contained in a metal side car attached to the motorcycle. The transmitting power is approximately one kilowatt with a resultant radius for the wireless telegraph of 80 to 100 miles, and about half that distance for the radio telephone.

Current is supplied to the telephone or telegraph by a high voltage direct current generator connected directly to an independent motorcycle engine contained within the side car. In this connection mention should be made of the fact that the wireless equipment comprises a complete unit entirely

independent of the motorcycle. It can be readily detached and pushed by hand or loaded upon a wagon and transported over rough ground. An extra wheel is provided, which can be attached to either hub of the side car of to the front or rear of the motorcycle.



RADIO OUTFIT IN A SIDE CAR

The antenna is supported by a light weight metal mast of tubular construction. The form is telescopic, so that the mast when collapsed can be easily strapped out of the way on the side of the car.—*Scientific American*, 3/27.

CONSIDERATIONS ON THE SENSITIVENESS OF THE HETERODYNE RECEIVER IN WIRELESS TELEGRAPHY.—By Marius Latour.—The following comprises a theoretical study of the sensitiveness of the heterodyne system using "crystal" rectifying detectors:

It is usually assumed that the current rectified by crystal detectors is proportional to the square of the alternating electromotive force which acts in the circuit of the detector. If this voltage is designated by v, the current in the receiving instrument (telephone or galvanometer) is $i = kv^2$.

Let it be imagined that into the receiving circuit an emf V of the same periodicity as v, but displaced in phase by the angle ϕ, is introduced. The resultant emf while receiving will be

$$V_t = \sqrt{V^2 + v^2 + 2Vv\cos\phi}$$

When not receiving, the rectified current is kV^2; while receiving, $k(V^2 + v^2 + 2Vv\cos\phi)$. Hence the change in the value of the rectified current due to receiving is $i' = k(V^2 + 2Vv\cos\phi)$. This is the change in current which acts on the receiving apparatus and measures, so to speak, the intensity with which signals are received.

It is, therefore, possible to consider the ratio $\eta = i'/i$ as the ratio of the sensibilities with and without the auxiliary periodic emf V.

In this connection it is of no importance that i' and i may occasionally be of opposite sign; the receiving apparatus operates no matter what the

direction of i' or i. One has accordingly only to consider the absolute values of these quantities.

From the above one derives

$$\eta = \frac{i'}{i} = 1 + 2\frac{V}{v}\cos\phi$$

Let a few special cases be considered:

$\phi = 0$. The two emfs are in phase. For this special case

$$\eta = 1 + \frac{2V}{v}$$

$\phi = \pi$. The two emfs are in opposition. For this special case

$$\eta = 2\frac{V}{v} - 1$$

$\phi = \text{arc cos } (-v/2V)$. The resultant emf is equal to the component emf V. For this particular case $\eta = 0$. There are, therefore, cases where the introduction of an auxiliary emf diminishes the response and, in fact, makes receiving impossible whenever the values are in the neighborhood of arc cos $(-v/2V)$.

Let it now be imagined that the voltage V is not of quite the same periodicity as the voltage v, this case corresponding to the conception underlying the heterodyne system.

One can assume in this case that ϕ takes all the successive values between 0 and 2π and introduce the conception of η_m as an average η. Considering only the absolute values of η, one finds

$$\eta_m = \frac{1}{\pi}\left[\int_0^{\text{arc cos }(-v/2V)}\left(1 + 2\frac{V}{v}\cos\phi\right)d\phi - \int_{\text{arc cos }(-v/2V)}^{\pi}\left(1 + 2\frac{V}{v}\cos\phi\right)d\phi\right]$$

$$= \frac{\left[2\text{ arc cos}\left(-\frac{v}{2V}\right) - \pi\right] + 4\frac{V}{v}\sqrt{1 - \frac{v^2}{4V^2}}}{\pi}$$

In the case where $2V$ is very large as compared to v, η_m reduces itself to

$$\eta_m = \frac{4}{\pi}\frac{V}{v}$$

In the above there has been considered, so to speak, the average current rectified between 0 and 2π. One might, however, have approached the problem in a simpler and more direct, although less exact way.

The two extreme values between which the rectified current varies in the case of voltages v and V of nearly the same periodicity are $k(V+v)^2$ and $k(V-v)^2$. The difference between these two values is $4kVv$. If one considers this last value as a measure of sensitiveness of receiving, one finds for η the value

$$\eta = 4\frac{V}{v}$$

It is, however, more probable that the average value is the better measure. —*Electrical World*, 5/1.

NO RECORD, BUT HIGHLY IMPORTANT.—Though the successful establishment and maintenance by our government of wireless communication with Panama, by day as well as by night, breaks no distance records, it is still an achievement with so few predecessors that it excites satisfaction and admiration, even though it cannot any longer produce wonder. Nothing electrical can easily do that, nowadays, for we all come to where we are

ready to believe in the unlimited possibilities of what is now almost the most used, though still the least understood, of energy's forms.

With points as remote as Panama, and, indeed, with those much nearer, we can as yet only communicate by means of signals, the wireless analogue to the old-fashioned telegrapher's dots and dashes, but Mr. Marconi and the other qualified prophets say confidently that before long the wireless telephone will equal, and later will far outdo, the one now dependent on the use of a metallic circuit. Then anybody anywhere—who has the price—can talk, if not face to face, at last in effect ear to ear, with almost anybody else in almost any part of the world. Conversation with planetary neighbors is still out of sight, but probably Prof. Percival Lowell, who is more confident than most people that planetary neighbors exist, is already thinking about it.

Meanwhile, wireless telegraphy through all the 24 hours and as far as Panama is a "facility" that may be of enormous advantage to us. It is safe from such attack as that of the cable-cutters in Cuba and the Philippines, not to mention those much more recently active, and no nation provided with it can be prevented from transmitting facts—or fancies—to the other nations where either will be to its real or imagined advantage. Also, it deprives military and naval commanders of their old excuses for exercising discretionary powers. That is an advantage or a disadvantage, according to circumstances, but probably most often it will make for peace and against war, and is therefore on the whole desirable.

Incidentally, the government, by the success of its new plant, made in defiance of much good advice, has proved that there is more than one way of doing this, as most other things. Whether best or not, the chosen system meets the pragmatic test—it works.—*N. Y. Times*, 5/5.

CANALS

SIX MONTHS' PANAMA CANAL TRAFFIC.—During the first six months' operation of the Panama Canal, ending February 14, 1915, 496 commercial vessels passed through the Canal, carrying total cargoes of 2,367,244 tons. Of these 252 vessels passed east bound and 244 passed west bound, the cargoes carried being, respectively, 1,340,625 tons and 1,026,619 tons. Slightly over 41 per cent of the cargoes carried was in the U. S. domestic trade. Over 21 per cent was in transit between the North Pacific and Europe; 21 per cent was bound from the west coast of South America to the east coast of the United States and Europe, and 12 per cent was bound from the Atlantic coast of the United States to the Far East. The six principal commodities shipped through the Canal have been, in order of tonnage: Grain, nitrate, coal, refined petroleum products, lumber, and cotton. The six commodities together have amounted to approximately one-third of all goods shipped through.

The tolls levied during the six months' period amounted to $2,126,832. Adding to this the $11,610.69 of tolls collected on barges prior to August 15, the total levy to February 15, 1915, is $2,138,442.69.—*Shipping Illustrated*, 3/20.

SUEZ CANAL TRAFFIC.—According to the annual statement issued by Messrs. Worms and Co., in their Suez Canal weekly list, there passed through the Suez Canal during the year 1914 a total of 4802 vessels, of 26,866,340 tons gross, which compares with 5085 vessels, and 27,737,188 tons gross in 1913, and 5373 vessels, of 20,008,915 tons gross in 1912. The total receipts in 1914 were 122,249,000f., compared with 126,651,000f. in 1913, and 136,424,000f. in 1912.

British ships were by far the greatest users of the canal, the number in 1914 being 3078 of 17,756,322 gross tons, which is slightly above the British tonnage passing through in 1912, but over 1,200,000 tons more than in 1913. The figures for Germany show a remarkable reduction, these being: 1914, 481 vessels of 2,691,755 tons gross, 1913, 778 vessels of 4,694,350 tons gross, and 1912, 698 vessels of 4,241,001 tons gross.

There has likewise been a big falling off in the number and tonnage of vessels under the Austrian flag, the figures being: 1914, 176 vessels of 870,140 tons gross; 1913, 246 vessels of 1,162,441 tons gross; 1912, 248 vessels of 1,186,971 tons gross. The following figures show the percentage of the respective flags (based on gross tonnage) which passed through the Suez Canal during the year 1914:

British	66.09 per cent
German	11.02 per cent
Dutch	7.17 per cent
French	4.53 per cent
Austrian	3.24 per cent
Italian	1.94 per cent
Japanese	1.81 per cent
Russian	1.01 per cent
Danish	0.81 per cent
Greek	0.67 per cent
Swedish	0.65 per cent
Norwegian	0.48 per cent
Spanish	0.39 per cent
Turkish	0.13 per cent
Siamese	0.03 per cent
American	0.02 per cent
Persian	0.01 per cent
	100.00 per cent

—*Shipping Illustrated*, 4/3.

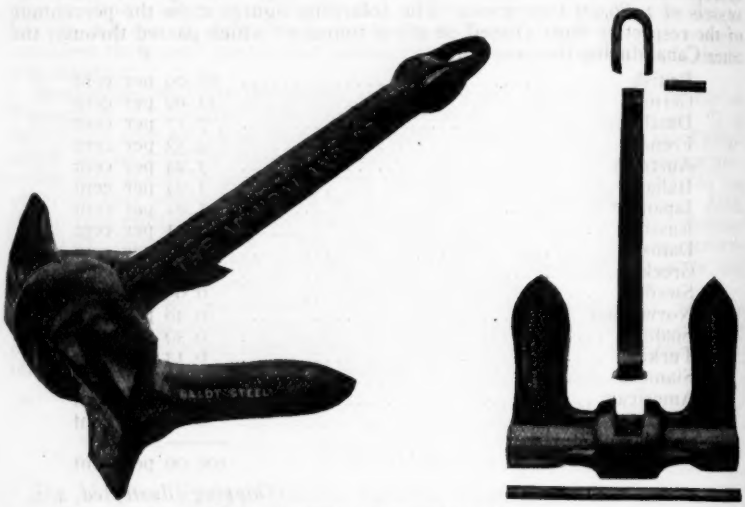
MISCELLANEOUS

A POPULAR STOCKLESS ANCHOR.—The Admiral Stockless Anchor, manufactured by the Baldt Steel Company, New Castle, Del., is the latest improved patent of Frederick Baldt, and has many distinctive features that are the result of years of experience in the manufacture of anchors. All parts of this device are made of acid open hearth steel, having a tensile strength of 60,000 to 70,000 pounds per square inch, an elastic limit of 35,000 to 40,000 pounds, and an elongation of 20 per cent to 30 per cent. The anchor is simple in construction and has no angular surfaces on which a chain can foul. It will take hold with both flukes simultaneously and will not roll from side to side, nor will it break the mud in entering it, as the flukes are parallel to the shank and make a straight pull. It houses close to the ship's hawse pipe and every part is more than doubly as strong as the cable of any given size anchor.

Its weight is evenly distributed and does not occupy any unnecessary space with large bosses on back of the body, thus making a very neat and symmetrical design, and when the anchor is let go it assumes the position of its original assembly. There are large lugs on each side of the shank, which fit in corresponding recesses in the flukes, and when assembled in that way without the use of the large body pin will withstand the regular pulling test to which all anchors are subjected. In other words, its strength under stress is in no way dependent upon the through pin. It

has been approved and accepted by the American Bureau of Shipping, Lloyds Register, Bureau Veritas, and the United States Navy.

The new steamers *Great Northern* and *Northern Pacific* of the Great Northern Pacific Company are equipped with the Admiral Anchor and it is also in use on the battleship *North Dakota*, collier *Neptune*, and many steamers and vessels of the leading steamship companies. It is made in sizes from 30 to 20,000 pounds each, and the features described above make it a superior article in stockless anchors, which accounts for its rapid rise



THE ADMIRAL STOCKLESS ANCHOR

to popularity. The New York office of the Baldt Steel Company is located in the Trinity Building, 111 Broadway.—*Marine Journal*, 4/10.

A. B. C. UNION.—Considerable importance is apparently to be attached to the journey of Dr. Lauro Muller, the Brazilian Minister for Foreign Affairs, to Argentina, Chili, and Uruguay. Dr. Miller commenced his journey on April 26. It is generally believed that the visits which he will pay will mark an attempt to establish a policy of Pan-Americanism, in accordance with which the South American republics will take joint action in matters pertinent to South American affairs and to relations with foreign countries which affect South America. An interesting, if somewhat alarmist letter on the question was published in the *New York Times* of April 30, in which the writer sought to show that the contemplated rapprochement of the South American republics is inimical to the United States. Formal denial to such an implication was made by Secretary Bryan in a statement to newspaper correspondents on May 1.—*The Nation*, 5/6.

THE USE OF COPPER IN WAR.—A writer, vouched for by the *London Times* as "one of the first living authorities on the statistics and use of copper," publishes in that paper some interesting statistics on the use of copper in the present war. He estimates the number of Germans under arms at 4,000,000; Austrians, 2,500,000. He reckons 2½ men per yard on a firing line of 750 miles, 1,320,000 yards, or, leaving out artillery, cavalry and auxiliaries, one man per yard, or 1,300,000 rifles, each firing twenty

shots, or 26,000,000 shots every twenty-four hours. This consumes roundly 305 tons of copper ($26{,}000{,}000 \times 6.77$ dr. $= 687.578$ lbs.); add for Maxims 30 tons, a total of 335 tons. The possible recovery of expended cartridges on hard soil, none in mud, reduces this by 17 tons.

To these figures must be added those for artillery fire. This it is difficult to estimate. It is said that on some of the "hottest" days of the battle of the Marne the Allies fired 180,000 shells. On the other hand, certain authorities claim that France cannot manufacture more than from 70,000 to 80,000 shells a day. To be brief, and to be well within the truth, suppose we admit for the English, French and Belgian artillery an expenditure of 90,000 shells a day. The Germans must respond with at least an equal number, especially if we consider the greater length of the fighting line on her eastern frontiers and the numerous important battles which have there taken place. This gives a total of 180,000 shells a day. Let us say 150,000. The brass used for these shell cases and shells may be estimated as follows:

1st—150,000 fuses of an average weight of 7 oz. fully lost, roundly	65,625 lb.
2d—150,000 cartridges of an average weight of 61 oz., of which about 80 per cent are recovered $\frac{150{,}000 \times 61 \times 0.2}{16}$ roundly	114,375 lb.
3d—About 200,000 rings (to fit the rifling) for shells entirely lost	56,250 lb.
Total	236,250 lb.

The weight of brass lost will be 105 tons and 1050 pounds, making with the above mentioned 318 tons a total of 433 tons 1050 pounds, say 430 tons. The copper in the brass used by Germany and Austria-Hungary forms 72 per cent of this metal. The total need of copper for the above mentioned weight of brass is therefore $430 \times 0.72 = 309$ tons 2 cwt. These 309 English tons each day make in round numbers 112,000 tons a year.

To face such a need of copper Germany has, of course, her accumulated stores. But these are not inexhaustible unless uninterruptedly renewed. She has, too, the importation of metal through neutral countries. In time of peace Germany produces on an average, 26,000 tons of copper. This output can be increased, but not indefinitely. At the utmost we do not think it could be increased by 40 per cent. Let us admit, however, that Germany can produce 36,000 tons.

It is said that Austria produces 4000 tons of copper yearly. This is highly problematical. Indeed, the production of Austria might, in all likelihood, be estimated at nothing. However, admitting 4000 tons, we get a total output for both empires of 40,000 tons a year. Their annual need of copper for the actual war will then be $112{,}000 - 40{,}000 = 72{,}000$ tons—that is, about 7200 railway wagons, 360 trains of 20 wagons each.—*Army and Navy Journal*, 4/3.

NAVAL LESSONS OF THE WAR

ESSENTIALS OF SPEED, ARMOR, AND ARMAMENT COMPARED IN WORLD'S LATEST BATTLESHIPS.—America, that land of light and leading in most things that are, for the moment, the "greatest on earth," has recently placed in the water the largest battleship afloat—the first capital ship to displace over 30,000 tons. With a full load, the recently-launched *Pennsylvania* will displace about 32,500 tons. There are South American Republics who have had ships as large as this designed for them, but they have not reached the launching stage. This leviathan is being built at Newport News, and is a sea-giant at every point. She is 608 feet over all, and has a beam measuring 97 feet. She will be clothed for the greater part of her

length with 14-inch armor of the latest description, while 18-inch armor will enshroud her turrets and protect the 14-inch guns they contain. The extreme ends of the ship, beyond the turrets, will, however, be unprotected. She will steam 21 knots exclusively on oil fuel, and will carry twelve 14-inch guns in four triple turrets, together with twenty-two 5-inch weapons for secondary fire and use against torpedo craft. These latter weapons will not have their positions protected by armor. The turrets for the 14-inch ordnance will be superposed, and so arranged as to allow of the whole 12 being fired on the broadside, with six to fire salvos ahead or astern. A single smoke-stack will be given heavy armor protection at its base, and the ship will carry 2900 tons of oil fuel.

Briefly, that is the description of the things that matter in one of the world's latest and largest battleships. There are our own group of *Queen Elizabeths* coming to hand month by month, or week by week, but although their guns are heavier than those of the *Pennsylvania,* they are not so numerous—eight 15-inch in the British ships and twelve 14-inch in the American—nor do the British ships displace nearly as much water, 29,000 tons being, so far, the British record in this direction. The Germans, on the other hand, are building battleships to carry eight 15-inch guns as a primary armament, which will displace 32,000 tons (like the *Pennsylvania*), thus absorbing 3000 tons more displacement for the same armament as our *Queen Elizabeth* class. We shall, however, probably have a group of eight of these vessels equipped and in our first fighting line long before the first of the German ships, the *Hertha,* hoists the pennant for active service. Two of the German ships are to have 100,000 horse-power engines, which looks like high speed. The British *Tiger,* which took part in the battle off the Dogger, has 110,000 h. p. engines, and the *Queen Mary* has 75,000 h. p.; the *Lion* and *Princess Royal* having 70,000 h. p.; whereas the *Dreadnought* has only 23,000, and the earlier battle-cruisers of the *Indomitable* type, 41,000 h. p.; while the *Queen Elizabeth* has 58,000. As speed has proved to be such a vital factor during this war, these figures are of great interest. The h. p. of the German and Austrian battle cruisers and battleships compare favorably with the British, but are not, on the whole, and ton for ton in displacement, so good. The Germans have three ships only with 100,000 h. p. engines, but the h. p. of any single unit in the Austrian Fleet, completed or building, does not exceed 40,000. The latest Italian ships scale to 48,000 h. p., American to 31,500 h. p., Japanese to 64,000, French to 33,000, Russian to 66,000, and the Greek *Salamis* to 40,000 h. p.

Not less interesting than the speed of vessels, indicated by the above figures, is that of displacement. Is the battleship of the future to increase to still larger dimensions or to recede to that of medium size for which so many of us argued in pre-war days? At the moment, experience in fighting twixt really modern ships of the dreadnought type has been so small that it is impossible to say. One thing, however, stands out clear from such fighting as has taken place. Speed and gun-power are the chief essentials in the capital ships. Whether in open sea fights or for long-shore operations, the gun is the prime factor, and to carry the gun to the most advantageous position the platform on which it is mounted must have the utmost possible mobility. Top speed must be linked to superior gun power. Are this gun power and speed to be installed on large or small gun-platforms? That is the question yet to be settled. To build large ships must be to put many eggs in one basket, and we now know how easily a Whitehead from the subtle and crafty submarine can send a monster battleship to the bottom. On the other hand, it is extremely desirable that when we get a long-range salvo, or broadside, home on the enemy, it shall be a knock-out or a stunning blow, whose force will make him reel and leave him holed and groggy. It is better to straddle an opponent with a broadside of eight, ten, or twelve guns of the largest caliber, than with four, six or eight. When ships can be knocked out in five minutes by accurate shooting, the broadsides and salvos used must not come from small or weak

ships. The one big ship is often in a position to strike a better blow than two weaker ones. *Big Eliza* at the "Dardanelles" is a case in point. She was able to lay off and pound the forts to dust when the smaller ships could not touch them. It is better to remember these things than try to conveniently forget them. Smaller ships could carry the largest guns, but the weight of her blow would be so reduced by small numbers that the well-directed salvo or broadside could hardly give the knock-out blow supplied by the bigger ships. And in these days it has been proved that it is a big, early blow which is largely responsible for deciding the action. The point is not altogether settled yet, but so far these are the indications. An open mind must be kept and opinions remodelled by experience as necessary.—*United Service Gazette*, 4/8.

FLOTILLA LEADERS.—It was officially announced on Monday that the new flotilla leader *Botha* has just been commissioned for service. The type to which the *Botha* and *Tipperary* belong is new to the British Navy, but of its usefulness there can be no question. It has been called into existence by the nature and necessities of destroyer work under modern conditions, and after a good deal of experience with other types which proved unsuitable. The essence of the new design would seem to be its speed, an element of battle efficiency whose importance has been demonstrated over and over again during the present war. With the increase in the sea speed of destroyers which has come about of late years, it might happen that the parent vessel of a flotilla, generally a light cruiser, had a designed speed of about 5 or 6 knots less than that of the boats attached to her. Thus it was not altogether surprising that after the maneuvers one year in which certain flotillas were worked without flotilla cruisers a decision was arrived at to withdraw the vessels formerly employed on the latter duty and attach them instead to the battle squadrons. The special destroyer, *Swift*, then came into her own as a flotilla leader. In the Navy Estimates of 1914-15, the First Lord announced in his explanatory memorandum that of the 16 destroyers authorized in the previous year only 13 had been proceeded with, and in place of the other three it had been decided to build two large destroyers for service as flotilla leaders. Orders for these vessels were placed in February, 1914, and they were named the *Lightfoot* and *Marksman*. On the eve of war being declared, the Admiralty took over the large destroyers in hand for Chile at White's yard, Cowes, for similar service, and christened the first pair the *Broke* and *Faulknor*. The *Botha* and *Tipperary*, although no statement on this point has been made, are presumably the remaining pair. It will be remembered that there were six destroyers in this contract, which was placed in September, 1911, and the first two, named after Admirals Condell and Lynch, had been completed and delivered some time before war broke out.—*Army and Navy Gazette*, 4/17.

SUBMARINE VS. DESTROYERS.—In discussing the question as to whether the popularity of destroyers is likely to wane to the point at which they will be no longer built in their present form, there are more factors to be weighed than some of their champions appear to remember. The flame from the funnels of a fast traveling oil or coal burning destroyer has never been sufficiently suppressed by any device to prevent it handicapping her on most occasions in a night attack at sea, carried out under conditions approximating to those that exist during war. This handicap is still to be found in our destroyer flotillas. But if the submarine can be given a surface speed sufficient to enable her to make a surface torpedo attack on a battle fleet and to operate generally with squadrons on the sea, in all but very bad weather, then there appears to be little reason why the destroyer should not be relieved of night attacks, since there are no tell-tale flames to "give away" attacking submarines during long approaches, and she would thus be the better craft for this offensive function. The present defensive duties of

destroyers will, so far as can be seen, pass by a process of evolution to the new type of cruiser, with certain armor protection, which is being evolved by ourselves and by Germany. We are certainly building fewer destroyers this year if our Navy Estimates are to be taken as any guide, and in all probability we shall presently find a large number of light cruisers added to our fleet. But a new type of destroyer will apparently be needed to protect our fleet against submarines, which is work they have been doing excellently well.—*United Service Gazette*, 4/1.

UNDERWATER PROTECTION DISCUSSED.—We have made vessels all that can be desired in above-water and water-line properties, but we have neglected them below. If we had now but a dozen ships of no better quality than the first dreadnought, but so protected that the mine and torpedo were no menace to them, the German fleet could be driven out of its hiding-places and Constantinople would already lie at our feet. Above-water attack is not dreaded; it is the continual menace of the mine that controls the movements of all fleets. Here we have a problem which must be faced in the near future, and we may be confident that this war at least will lead directly to a change in warship design of a marked kind. We do not suggest that this problem has hitherto been wholly overlooked. On the contrary, we know that it has exercised the minds of all ship-builders, and there are good reasons for believing that our latest vessels are not so vulnerable as earlier types, but that we are still a long way from having found a perfect solution must be admitted. That it must be found is equally obvious, for the first nation that can combine with our over-water design, the merits of which have now been demonstrated beyond a shadow of doubt, invulnerability below water will have the mastery of the seas at her disposal. That that end can be obtained in reasonable measure we do not doubt. Sacrifices will be necessary, something else must be given up to attain an end so important. The warship is a compromise between what we deem best and what we deem essential. The torpedo-proof bottom has become essential; we must therefore give up guns, or armor, or speed or something else to make it practicable. One thing that seems likely to go is the torpedo on battleships and battle cruisers. With actions fought at the ranges necessitated by big guns, and in view of the fact that vessels can be sunk by gun fire alone, its retention would almost seem an anachronism. That much weight could be saved by its omission cannot be claimed, but it would at least leave space for the carrying of larger supplies of ammunition, a matter which has also become vital in view of the fact, on which Lord Bristol commented in his address to the Institution of Naval Architects, that actions are not fought out as some admirals expected, in a few minutes, but occupy hours. We advance this rather as one of the changes in battleship design that is likely to result directly from the war than as any serious step towards the provision of an armored bottom. To reach that object much greater weights must be sacrificed, and it may be found necessary to weaken either the power of attack or defence above water. The art of the naval constructor lies in the making of compromises of the kind in the best possible way, and, with the knowledge that British constructors still retain their traditional skill in this respect, and have, moreover, more opportunities for experimenting, since our output of ships for ourselves and other nations is greater than that of other countries, we do not doubt that the best solution will be evolved in home ship-yards. There is, of course, always the possibility that some entirely different form of defence against mine and torpedo attack may be discovered, but there we tread upon ground which, for the moment, is forbidden. Closely associated with this subject is the destruction of submarines, and here, again, we are likely to see the direct influence of the war upon design. The real ram has for many years been given up by most navies, but since ramming tactics have been proved by experience one of the most effective rejoinders to submarine attack, it is in no small

measure probable that we shall see many vessels, particularly small and very rapid boats, built as submarine destroyers and fitted with special bows. All our bigger ships have, of course, strong stems, which in many cases are almost ram-like, and many of our smaller vessels are built somewhat on the same lines, but they are not ships of the highest speed, and in many cases the ram is turned upwards so as to strike an ordinary surface vessel near the water-line. The ram so placed might tend to ride over or vault, as it used to be called, a submarine; it will seem, therefore, desirable to carry the ram forward in line with the keel. Some thirty years or so ago the torpedo-ram was much in the public eye, particularly in America, where the lessons of the War of Secession appeared to point to its value. Here we built the *Polyphemus* and there the *Katahdin* was built. Neither type was perpetuated, but the influence of the ram has remained with us more or less up till now. Is the present war going to displace our views about it in large ships? Are we likely to see special ram vessels again constructed? —*The Engineer*, 4/9.

GUARDING AGAINST LOSSES BY COLLISION.—As was to be expected, the navy's share in hostilities has had the effect of accentuating interest in the question of the means of preventing the sinking of ships as the result of collisions or contact with mines. Especially opportune, therefore, is a work published by Capt. Emilio Menada, manager of the Societa Commerciale Italiana Steamship Company. In the course of this work, for a summary of which we are indebted to *Engineering*, Captain Menada describes the effects of many collisions in recent years, and comes to the conclusion that, in the great majority of cases, where a colliding vessel had a clipper bow the opposing vessel was not so seriously damaged as to involve sinking. Indeed, even in the case of a straight stem and a blow at right angles, the penetration of the colliding vessel rarely exceeded 10 feet. With a glancing blow the penetration is less, but the danger is greater, owing to the probable increased number of compartments opened to the sea. He attaches great importance to the strength of the deck-stringers, and contends that bulkheads should not only be sufficiently numerous, but should be without doors. The principal point of his argument, however, is that if the ship had longitudinal bulkheads parallel to, and not less than 14 feet from, the outer skins of the ship, such a bulkhead would never be struck by the bow of a colliding ship. In the worst event, it might be deformed, but not fractured. In order to illustrate such application he gives particulars of the design of a ship having a length of about 170 meters (about 558 feet), a breadth of 21 meters (69 feet), and a draft of 12.50 meters (41 feet), fitted with six double-ended and two single-ended boilers, with combination machinery of 20,000 horse-power. The space between the skin of the ship and the longitudinal bulkheads is divided by transverse bulkheads 12 meters (39 feet 4 inches) apart, while the space between the two longitudinal bulkheads is similarly divided by transverse bulkheads into spaces to suit the boilers and their coal-bunkers. Captain Menada arranges for the bunkers to be situated on the inside of the longitudinal bulkheads, and to be fed from hoppers, and utilizes the space between the skin of the ship and the longitudinal bulkheads, the lower part for cargo and the upper part for passenger accommodation and staterooms. It is known that for some years past British naval architects have been devoting special attention to the subject, but to what extent they have succeeded in solving the problem has yet to be disclosed.—*Naval and Military Record*, 3/31.

"SEA POWER'S" SUPREME HOUR.—It is said that in this present war no fewer than 1500 British merchant steamers have been requisitioned for government service. Some are armed auxiliary cruisers; many are transports; many are fuel, ammunition or provision ships. Some are prison hulks; some are dragging for mines. These merchant ships are playing

an indispensable part in the great conflict, and it is not easy to see what the British and their allies would have done but for the fortunate existence of 20,000,000 tons of shipping on the register of the United Kingdom and her colonies. All that the late Captain Mahan, U. S. N., ever wrote of the importance of "sea power" in war is being vindicated in this momentous struggle. It is "sea power" that is steadily turning the scale of victory. On the land, so far as contending armies are concerned, the outlook is still indecisive and uncertain. But Great Britain and her allies dominate the oceans of the world through the overwhelming strength of the British Navy and the vast magnitude of the British mercantile marine. Away from the German coasts, not one regular German naval ship, so far as is known, now remains in active service, and the Imperial flag is carried only by one or two lone, roving merchantmen, "commerce destroyers" whose activities can make no appreciable impression on the three or four thousand British liners and cargo craft regularly employed in international commerce.

If the British and German war and merchant navies had been equally matched in strength and numbers, the sea would now be witnessing an appalling spectacle of battle and destruction. German squadrons would be raiding British food ships; people would be starving in British towns, and a terrific combat for the cutting off of all supplies and materials of industry would be in progress all over the world. As it is, the food ships are reaching British ports with almost no interruption. Out of 1500 vessels entering and leaving British waters in a week, only eight were torpedoed by German submarines. That vaunted "blockade" is virtually ineffective. But the British Government through its command of the seas is beginning to enforce a real blockade of Germany, in its sweeping declaration forbidding any trade in merchandise of German origin, ownership or destination. The British people are being saved from industrial paralysis and national ruin chiefly by their ships and sailors, without whose supremacy no British army could have been moved to the defence of France and the rescue of Belgium.—*Marine Journal*, 4/17.

COMPULSORY PILOTAGE AND THE WAR.—Not only the shipping interests of Great Britain, but the public generally are beginning to realize the debt of gratitude due the regularly trained British pilots that have successfully faced the extraordinary dangers which the war has imposed upon their calling. In piloting transports, particularly, the pilots have proved themselves of inestimable value, and these have come and gone without serious mishap so far. In view of the service rendered, the pilots are justly appealing to the government to make some provision for them in the event of their death or injury through mines, torpedoes, or other hostile operations of the war. This matter has been taken up by the United Kingdom Pilots' Association and an assurance has already been given on the question of compensation. Compulsory pilotage has also been extended to all ships (other than British of less than 500 ton gross tonnage, when trading coastwise and not carrying passengers) while navigating in the waters from the Downs Pilot Station to Gravesend or Great Yarmouth, or *vice versa*, and all ships (other than British of less than 3500 tons gross tonnage, when trading coastwise and not carrying passengers) while navigating between London Bridge and Gravesend or Gravesend and Yarmouth, must be conducted by pilots licensed by the London Trinity House.

Here is an object lesson for those who oppose compulsory pilotage in the United States that should be convincing. With this profession unprotected by law, the training of men for this calling would be a very haphazard thing, and it is only when emergencies arise that the advantage of organization along such lines can be fully appreciated. No one can deny that the trained pilots of the United Kingdom are at present saving much life and property that would otherwise undoubtedly have been lost but for their expert training and skill.—*Marine Journal*, 4/24.

WAR AND ECONOMICS.—It is extraordinary how blind many so-called economists were to the economic value of sea power. They assumed that the British Navy was merely an aggressive force, and that the money spent upon it was money wasted. Time and again in the House of Commons so-called economists denounced the expenditure upon the navy as being unproductive, and painted an alluring picture of the blessings which could be conferred upon the poor and needy if only less money, as they termed it, "was poured into the sea." Now mark the experience of war. Immediately the Anglo-French squadron began the bombardment of the Dardanelles, the wheat gamblers in Chicago took fright and the price of wheat began to be steadily marked down. The guns in the Dardanelles produced an economic effect far away in Chicago, and this almost immediately reacted on the economic position in Europe. It was at once decided that the wheat quotations in England for corn and flour should be reduced. These results were all the more remarkable in view of the fact that the operations of the Anglo-French squadron in the south commenced almost immediately after Germany's declaration of the "war zone" round the British Isles had led to some increases in freights. The effect of the fire on the forts of the Dardanelles was sufficient to more than counteract the rise in freights. This again illustrates the value of the command of the sea. Neither Germany nor Austria-Hungary felt any reflex action owing to the fall in the price of wheat in Chicago, although Germany claimed to be carrying out a sort of blockade of Great Britain and the northern coasts of France. If the control of sea communications exercised by the Anglo-French forces had been less complete than it is, both enemies would have shared, to some extent at least, in the cheapening of food supplies. Every incident in the war shows that the British fleet, great as was the cost of its maintenance, is repaying to the nation every penny which was spent upon it.—*Naval and Military Record,* 3/10.

MR. WINSTON CHURCHILL'S SPEECH ON THE BRITISH NAVY.—On the motion to go into committee on the navy estimate in the House of Commons. Mr. Winston Churchill said: "After the outbreak of war my noble friend Lord Kitchener, Secretary of State for War, had to create an army eight or ten times as large as any previously maintained or even contemplated in this country, and the War Office has been and is engaged in a vast process of expansion, improvization, and development entirely without parallel in military experience. Thanks, however, to the generous provision made so regularly for the last five years by the House of Commons for the Royal Navy, no such difficulties of labor have confronted the Admiralty. On the declaration of war we were able to count upon a fleet of sufficient superiority for all our needs, with a good margin for safety in vital matters, fully mobilized, placed in its war stations, supplied and equipped with every requirement down to the smallest detail that could be foreseen, with reserves of ammunition and torpedoes up to and above the regular standard, with ample supplies of fuel and oil, with adequate reserves of stores of all kinds, with a complete system of transport and supply, with full numbers of trained officers and men of all ratings, with a large surplus reserve of trained men, with adequate establishments for training men, with an immense programme of new construction rapidly maturing to reinforce the fleet and to replace casualties, and with a pre-arranged system for accelerating the new construction which has been found to yield satisfactory and even surprising results. (Hear, hear.) I will draw the attention of the House in illustration of this to three particular points. First of all, the store of ammunition. If honorable members will examine the long series of figures for Vote 9 in the last five or six years, particularly in latter years, they will see an enormous increase in that vote. In time of peace one gets little credit for such expenditures, but in time of war we thank God that it has been made. (Cheers.)

"Then take the store of oil. Most pessimistic prophesies were made as to the supplies of oil, but no difficulty has been found in practice in that regard. The estimate which we had formed of the quantity of oil which would be consumed by the fleet in war proved to be much larger than our actual consumption. On the other hand, there has been no difficulty whatever in buying practically any quantity of oil. Not a single oil ship has been interfered with on its voyage to this country, and the price of oil is substantially below what it was when I last addressed the House on the subject. Indeed, we have made it possible to do what we have long wished to do, but hesitated to decide upon on account of gloomy prophesies and the views which were entertained—to convert the Royal Sovereign to a completely oil-fuel basis. So that this ship, equally with the *Queen Elizabeth*, will enjoy the great advantage of liquid fuel for war purposes.

"As regards men, no more widespread delusion existed abroad than that, although we might build ships, we could never find the men to man them, and even in some quarters in this country the idea was fostered that when mobilization took place ships could not be sent to sea fully manned. When mobilization took place we were able to man every ship in the navy fit to send to sea. We were able to man a number of old ships which we had not at first intended to send to sea, but which, after being repaired and refitted, we found to have possibilities of usefulness in them. We were able to man, in addition, powerful new vessels building for foreign countries and we were able to man several score of armed merchant ships, which have been taken up, and which play an important part in our arrangements for the control of traffic and trade. We were also able to provide all the men necessary for the Royal Naval Air Service, which never existed three years ago, but which has already made a name for itself (cheers) and is becoming a considerable and formidable body. (Cheers.) We were able to keep our training schools full to the very brim, so as to prepare a continuous supply of drafts for the new vessels which are coming on in such great numbers, and over and above we were able without injury to any of these important interests to supply the nucleus of instructors of trained men to form the cadres of the Royal Naval Division, which have now reached a respectable total, and have developed an efficiency which enables them to be counted on immediately as a factor in the defence of the country, and very soon as an element in the forces we can use overseas. (Cheers.)

"We have never been a military nation, although now we are going to take a hand in that. We have always relied for our safety on naval power, and in that respect it is not true to say that we entered this war unprepared. (Cheers.) On the contrary, the German Army was not more ready for an offensive war on a gigantic scale than was the British fleet for national defence. (Cheers.) The credit of this is due to the House of Commons, which, irrespective of party interests, has always, by an overwhelming and in latter years unchallengeable majority, supported the Government and the Minister in every demand made for naval defence. Indeed, the very disputes we have had from time to time have only been concerned with the margin of superiority, and have turned on comparatively small points respecting that. For instance, we have discussed at enormous length the percentages of dreadnought superiority available in particular months. The House of Commons as a whole has a right to claim the navy as its child, and as the unchanging object of its care and solicitude. Now, after six months of war, when new dangers and new difficulties are coming into view, we have every right to feel content with the results of our labors. (Cheers.) Since November, when I last addressed the House on naval matters, two considerable events have happened—the victory off the Falkland Islands and the successful cruiser action near the Dogger Bank. Both these events are satisfactory in themselves, but still more are they satisfactory in their consequences and significance. I shall venture to enlarge upon them, and hang the trend of my argument upon them.

First Phase Results.—"The victory off the Falklands terminated the first phase of the naval war by effecting decisively the clearance of the German flag from the oceans of the world. (Cheers.) The phase began with the blocking in of the enemy's armed merchantmen at the very outset, and the consequent frustration of his whole plan for the destruction of commerce, the reduction of his base at Tsing-Tao, and the expulsion of his ships from the China seas by Japan (cheers) the hunting down of the *Königsberg* and *Emden*, the latter by an Australian cruiser (cheers) who steps along the path, and the goal was finally reached when Admirl Von Spee's powerful squadron, having been unsuccessfully though gallantly engaged off Coronel, was brought to action and destroyed on December 8 by Sir F. Sturdee. Only two small German cruisers and two armed merchantmen remain at large of all their formidable preparations for the attack upon trade routes, and those vessels are at present in hiding. During the last three months on the average about 8000 British vessels have been continuously on the seas passing to and fro—there have been 4465 arrivals and 3600 sailings from the ports of the United Kingdom. Only 19 vessels have been sunk by the enemy, and only four of those vessels have been sunk by above-water craft. That is a very remarkable result to have been achieved after only a few months of war. I am sure if we had been told before the war that such a result would be so soon achieved, and that our losses would be so small, we should not have believed it for a moment.

"Certainly the great sailors of the past—of the revolutionary and Napoleonic wars—would have been astounded. Why, during these two great wars, which began in 1793 and ended, after a brief interval, in 1814, 10,871 British merchant ships were captured or sunk by the enemy. Even after the decisive battle of Trafalgar, when we had the undisputed command of the sea, the loss of British ships went on at the average rate of over 500 a year. In 1806, 519 ships were sunk or captured; in 1807, 559; in 1808, 469; in 1809, 571; in 1810, 619. Our total losses on the high seas in the first six months of the war, including all ships other than trawlers engaged in mine sweeping, losses of men and vessels scuttled by submarines—our losses for the whole of that period are only 63. (Cheers.) Of course, we must always be on the lookout for further attempts by the enemy to harass the trade routes, and although the oceans offer a rather bleak prospect to German cruisers, and the experience of their consorts is not encouraging, the Admiralty must be fully prepared for that possibility. But we shall be able to meet any new effort, as our advantage in men and resources is now incomparably superior to those which were at our disposal at the beginning of the war. (Cheers.) The truth is that steam and telegraphs have enormously increased, as compared with sailing days, the thoroughness and efficiency of superior sea power. Coaling, communication, and supplies are vital and constant needs, and once the upper hand has been lost it means almost insuperable difficulty to the weaker navy. Credit is due to our outlying squadrons (cheers) and to the Admiralty organization by which they have been directed.

"But it must never be forgotten that the situation on every sea, even the most remote, is dominated and decided by the influence of Sir John Jellicoe's fleet (cheers) lost to view amid the northern mists, served by patience and seamanship in all its strength and efficiency, silent, unsleeping, and as yet unchallenged. (Cheers.) The command of the sea which we have thus enjoyed has not only enabled our trade to be carried on practically without interruption or serious disturbances, but we have been able to move freely about the world a very large number of troops. The leader of the Opposition, in a speech he made the other night, quoted a letter from a shipowner in which he applied to the Admiralty Transport Department the word 'incapacity.' Of all the words which could be applied to the Admiralty Transport Department no word could be more unsuitable than the word 'incapacity.' In all, we have moved by sea, including wounded and Belgian

and French troops, approximately one million men (cheers) with, up to the present, no accident or loss of life. (Renewed cheers.) If that is incapacity we have an inexhaustible supply of it. The credit for these arrangements lies very largely with Mr. Graham Thompson, the head of the Transport Department, and one of the discoveries of the war—a man who stepped into the place when the emergency came, and has organized and presided over transactions the like of which were never contemplated by any state in history. When complaints are made that we have taken up too many transports or armed too many auxiliary cruisers, that we have made use of too many colliers or supply ships, I must mention that fact. The statement that the Admiralty has chartered approximately one-fifth of the British mercantile marine tonnage is correct. With that we discharge two duties, both of importance at the present time. First, the supply of fuel and the replenishing of ammunition to the fleet, and secondly, the transport, reinforcement, and supply of the army in the field, including the return of the wounded. It must be remembered in regard to the fleet that we have no dockyards or naval ports at our back, and that the bases we are using during the war have no facilities for coaling from the shore. We are not like the Germans, lying in the great naval port of Wilhelmshaven, on which 15 or 16 millions have been spent. Rosyth is not yet finished, and will not be available for some time. Everything, therefore, required to keep the fleet in being has to be carried and kept afloat in ships. What I may call the great mobile reserves of fuel and stores maintained at the various bases used by the fleet are fixed by the War Office staff, and approved by the Board of Admiralty, after consultation with the commander-in-chief, and where these amounts have been fixed the War Office has no option but to supply them. We cannot possibly run any risk of having the fleet rendered immobile. We must make assurance doubly sure, as the life of the State depends upon it. The fact, therefore, that particular vessels are noted by shipowners to be kept waiting for long periods is not a sign of mismanagement or incapacity on the part of the Admiralty. It should be remembered that we are supplying across the sea in the teeth of the enemy's opposition an army almost as large as the Grand Army of Napoleon, only vastly more complex in equipment and organization, and we are also preparing other armies still larger in number, and I do not know at what hour the Secretary for War will ask the Admiralty to move 20,000 or, it may be, 40,000 men. Plans are frequently changed on purpose at the very last moment, and I warn the House most solemnly against allowing grounds of commercial advantage or financial economy to place any hampering restriction or impediment upon these difficult and momentous operations.

"Careful and prudent administration does not stop at the outbreak of war. Everything in our power will be done to enforce it and to avoid extravagance. We shall therefore welcome the advice of business men on points where they can help us. Gradually, as we get more control of the situation, higher economy may be possible, but military and naval requirements must be paramount. I am afraid that I cannot hold out any hope of any immediate reduction in tonnage required by the Admiralty. More than a month ago I directed the Fourth Sea Lord to hold an inquiry into the whole use of merchant ships taken up by the Admiralty, including particularly transports, colliers, and supply ships, but after the most stringent scrutiny and consultation with the admirals afloat it was not found possible to make any appreciable reduction, and, indeed, since January 1 the requirements of the Admiralty have actually increased. The retention of a full number of colliers in attendance on the fleet is a naval necessity, and the retention of a large number of troop transports is a military necessity. In either case ships may be required at an hour's notice for urgent service, which may be vital to the success of our operations. An impression seems to exist in the House that the requisition of vessels on the outbreak of the war was done recklessly and without consideration for the commerce of the country. The number of ships to be taken up on the outbreak of the

war was so enormous, the requirements so varied, and their acquisition so urgent, that every suitable vessel in port at the moment was taken. I can well understand there would be some discontent among shipowners at the present time in consequence of the Admiralty requisition. Complaints are made that the requisitions are not fair as between shipowner and shipowner, and that all the tonnage of one line has been taken and all the tonnage of another line left alone.

"In other wars Admiralty business had been sought after by shipowners, and at the beginning of this war shipowners were only too glad to have their vessels taken over by the government owing to the uncertainty of the naval situation and the possibility of ordinary cargoes not being forthcoming. But now the naval situation is assured, for the present requisitioning powers exercised by the Admiralty enabled them to insist upon rates which, although they gave a profit to the shipowner, are less than those obtainable in the open market. The Admiralty rates are from a half to a third below the market rates, and therefore cannot be expected to be popular with shipowners. We are now paying 13s. to 17s. per gross ton, compared with from 30s. to 35s. paid in the early part of the South African War. Hence these complaints and talk of incapacity in certain quarters. (Laughter.) The general body of shipowners have lately met the government and been content to charter ships to us at rates very much below the market rate. The Admiralty is deeply indebted to the shipowning world for their cooperation. We regard the closest goodwill between the Admiralty and the Mercantile Marine as indispensable at the present time. The strain in the earlier months of the war has been greatly diminished by the clearance of the enemy's flag from the seas and oceans. The victory at the Falkland Islands was a memorable event, the advantage of which will only be fully appreciated by those who have full knowledge of all that has taken place.

Admiral Beatty's Victory.—"The combat off the Dogger Bank, in which the *Blücher* was sunk and the enemy made his escape into waters infested by his submarines and mines, is of the greatest advantage, because of the light it throws upon the rival systems of design and relative armaments and gunnery efficiency. This is the first test we have ever had, and it is most encouraging. It vindicates so far as it goes our theories of design, and particularly our big gun armament, always identified with Lord Fisher. The range of the British guns was found to exceed that of the Germans, and our shooting was, at least, as good as theirs. (Laughter.) It had been supposed that the Germans possessed a sort of super-efficiency in gunnery, but there is a feeling now, after this combat, that our naval officers were too diffident in regard to their professional skill in gunnery. Everything we have learnt so far leaves us no doubt of the wisdom and the excellence of our material. Our 13.5-inch gun is unequalled by any enemy weapon at sea. And now we have the 15-inch gun, which is vastly more powerful.

"Another remarkable feature of this action was the steaming of our ships. They all exceeded previous records. Despite the fact that they had been six months at sea, and that the greatest trial was suddenly demanded of them, their steaming excelled all their peace-time records. Nothing could show more remarkably the excellence of British machinery, the glorious feats of the engine-room branch, of the admirable system of repairs and refits, all effected with ceaseless vigilance and without exhaustion. (Cheers.) The *Kent*, for instance, in the Falkland Islands fight, although a 23½-knot, was worked up to 25 knots, caught the *Nürnberg*, and sank her. (Cheers.) The truth is the navy is as sound as a bell all through. (Cheers.) I don't care how or where it is tested, it will be found good and fit, keen and honest; it will be found to be the product of good management and organization, of sound principles in design and strategy, sturdy workmen and faithful workmanship, of careful clerks and accountants, skilful engineers, painstaking officers, and hardy tars. (Cheers.) It shows us and all the world that there is at present no reason to assume that, ship for ship and gun for gun, we cannot give a good account of ourselves. (Cheers.) It

shows that at 5 to 4 in representative ships the Germans did not think it prudent to engage, that they accepted without doubt or hesitation their inferiority, that they thought only of flight, just as our men thought only of pursuit, and that they were wise in the view they took. (Laughter.) If they had taken any other view they would unquestionably have been destroyed. That is the cruel fact and no falsehood—and many have been issued. (Laughter.) No endeavor to sink by official communiqués vessels which they could not stay to sink in war; no falsehood about that action will obscure that cruel fact.

"But when, if ever, the two great fleets draw out for a general battle we shall hope to bring into the line a preponderance not only in quality, but in numbers, which will not be 5 to 4, but will be something considerably greater than that. Therefore we may consider this extra margin as an additional insurance against unexpected losses by mine and submarine such as may at any moment occur in the preliminaries of a great pitched battle. It is for these important reasons that we must regard this action on the Dogger Bank as an important, and I think I may say a satisfactory event. (Cheers.) The losses of the navy, although small compared with the sacrifices of the army, have been heavy. We have lost, mainly by submarine, the lives of about 5500 officers and men, but we have killed, mainly by gunfire, about an equal number (cheers) which is, of course, a much larger proportion of the German forces engaged. We have also taken in sea fighting 82 officers and 934 men prisoners of war. No British naval prisoners of war have been taken in fighting at sea by the Germans. (Cheers.) When they had the inclination they had not the opportunity, and when they had the opportunity they had not the inclination. (Laughter.) For the loss of these precious British lives we have lived through six months of this war safely and even prosperously. We have established for the time being a command of the sea such as we had never expected, such as we had never known, and our ancestors had never known at any other period of our history. There are those who shut their eyes to all that has been gained, looking only at that which has been lost, and seeking to dwell upon it. They are not a very numerous class.

"We have been urged to hold a court-martial in every case where a ship is lost in action. (A Member: "Hear, hear.") To hear the talk in some quarters one would suppose that the loss of a ship by mine or submarine necessarily involved a criminal offence (some cries of "No, no") for which someone should be brought to book. The Admiralty have lately given careful consideration to this question. No doubt the precedents both in peace and war in the past, favor though they do not enjoin, the holding of courts-marital when ships are lost or captured. But the circumstances and conditions of modern naval war are entirely different from previous experiences. The mine and the submarine—especially the submarine—have created conditions novel, and present to naval officers problems of incomparable hazard and difficulty. In these circumstances courts-martial would frequently be inappropriate in our judgment, and often even harmful. Losses by mine and submarine must frequently be placed on the same footing as heavy casualties on land, and cannot be treated as presumably involving a dereliction of duty or the lack of professional authority. Further, the scope and scale of modern operations and the continuous demand on the attention of the Admiralty and on the services of naval officers, especially of high rank, make the actual holding of courts-martial very difficult and inconvenient. Energy ought not to be consumed by investigations and discussions of incidents beyond recall (cheers) but should be concentrated upon new tasks and new difficulties. Nothing could be worse for the navy or the Admiralty than for public attention or naval attention to be rivetted upon half a dozen novel causes célèbres, which would give opportunities for the most acrimonious and controversial discussions about which two opinions would always remain at the close. When a clear case of misconduct or failure in duty is to be presumed a court-martial may be necessary. When

special or technical questions are raised which it is desirable to elucidate with a view to precautions being taken to prevent a similar accident in future courts of inquiry have been and will be assembled, but in all these matters I must respectfully claim on behalf of the Board of Admiralty an absolute discretionary power. I ask the House, on behalf of the Board, for confidence and support during the war in this respect. (Cheers.)

"I would especially deprecate anything being done which tends to make officers, whether afloat or at the Admiralty, play for safety (cheers) and avoid responsibility for positive action. Losses have to be incurred in war, and mistakes will certainly be made from time to time. Our navy keeps the sea, our ships are in constant movement, risks are run every day —valuable ships run risks every day. The enemy is continually endeavoring to strike. Accidents from time to time are unavoidable. How do you suppose the battle cruiser squadron of Sir David Beatty was where it was when the action of the 24th of January took place? How many times is it supposed the cruiser and battle squadrons of the Grand Fleet have been patrolling and steaming through the North Sea, always exposed to the risk of mine and torpedo, before at last they reaped their reward. If any mood or tendency of public opinion arises, or is fostered by the newspapers, or given countenance to in this House, which makes too much of losses—even, it may be said, they are in some respects avoidable—you are then started on a path which, pressed to its logical conclusion, will leave our navy in its harbors instead of ruling the seas. When I think of the great scale of our operations and the enormous target we make, and the number of ships whose movements have to be arranged for, and the naval conditions to which I have referred, it is marvellous to me how few our losses have been. (Cheers.) The care and vigilance exercised by the admirals afloat and by the Admiralty staff appears to me—and will certainly be regarded by others studying this war in history—as praiseworthy in the highest degree. (Cheers.)

The New Warfare.—"The tasks which lie before us are anxious and grave. We are, it now appears, to be the object of a kind of warfare which has never before been practised by a civilized state. The sinking at sight, without search or parley, of merchant ships by submarine agency is a totally novel and unprecedented departure. It is a state of things which no one had ever contemplated before the war, and which would have been universally reprobated and repudiated before the war. (Cheers.) But it must not be supposed because the attack is extraordinary that a good defence and a good reply cannot be made. (Cheers.) The statutes of Ancient Rome contained no provision for the punishment of parricides, but when the first offender appeared it was found that satisfactory arrangements could be made. (Laughter.) Losses, no doubt, would be incurred, but we believe that no vital injury can be done if our traders put to sea regularly and act in the spirit of the gallant captain of the merchant ship *Laertes*. (Cheers.) If they take the precautions which are proper and legitimate, we expect that the losses will be confined within manageable limits, even at the outset, when the enemy may be expected to make his greatest effort to produce an impression. All losses can, of course, be covered by resort on the part of shipowners to the government insurance scheme, the rates of which are now one-fifth less than they were at the outbreak of war.

"Then the reply which we shall make will not perhaps be wholly ineffective. Germany cannot be allowed to adopt a system of open piracy and murder (prolonged cheering) on the high seas while remaining herself protected by a bulwark of international instruments which she has utterly repudiated and defied, but which we, much to our detriment, have respected. There are good reasons for believing that the economic pressure which the navy exerts is beginning to be felt in Germany. (Cheers.) We have to some extent restricted their imports of commodities, like copper, petrol, rubber, nickel, manganese, antimony, and the like, which are needed for the efficient production of war material and for carrying on modern war upon

a great scale. The German Chancellor's recent remarks, and the evidence of hatred and anger against this country which are so apparent in the German press, encourage us to believe that this restriction is proving inconvenient (laughter and cheers) and we shall, of course, redouble our efforts to make it so. (Hear, hear.) So far we have not attempted to stop imports of food, we have not prevented neutral ships trading direct with German ports, we have allowed German exports in neutral ships to pass unchallenged. The time has come when the enjoyment of these immunities by a state which has, as a matter of deliberate policy, placed herself outside all international obligations, must be reconsidered. (Loud cheers.)

"Further declarations on the part of the Allied governments will promptly be made which will have the effect for the first time of applying the full force of naval pressure to the enemy. (Cheers.) I thank the House for the attention with which they have listened to me. The stress and strain of this war are not imperceptible to those who are called upon to bear a part in the responsibility for the direction of the tremendous and terrible events which are now taking place. They have a right to the generous and indulgent judgment and support of their fellow-countrymen (hear, hear) and to the goodwill of the House of Commons. (Cheers.) We cannot tell what lies before us, or how soon or in what way the next great developments of the struggle will declare themselves, or what the state of Europe and the world will be at its close. But this I think we can already say—in so far as the British Navy is concerned—that although no doubt new dangers and perplexities will come upon us continually, and anxiety will make its abode in our dwellings, yet the dangers and anxieties which now are advancing upon us will not be more serious or more embarrassing than those through which we have already successfully made our way. (Cheers.) For in the months that are to come the British Navy, and the sea power which it exerts, will increasingly dominate the general situation. It will be the main and unfailing resource of the Allied nations, while progressively paralyzing the fighting energies of our antagonists, and it could if need be, even in default of all other favorable causes, ultimately by itself decide the issue of this war." (Loud cheers.)

Discussion.—Mr. Bonar Law said with reference to the First Lord's statement as to chartered ships not being fully employed by the Admiralty, the real ground of complaint was that proper care was not taken to ensure that ships did not remain idle, and he suggested that the advice of experienced shipowners should be obtained by the Admiralty on this point.

He expressed disagreement with Mr. Churchill's statement on the subject of courts-martial, and said the arbitrary action of the Admiralty was more likely to induce timidity in officers than would examination of their actions by courts-martial. He could not understand the grounds upon which the practice had been abandoned. If it was true that the danger from submarines could be guarded against by proper precautions, surely there was more need for courts-martial to be held in order to see whether precautions were taken. He agreed that the Admiralty should have absolute power of dismissal and selection of officers, but he could not see how that power would be curtailed by the holding of courts-martial in particular cases, and he thought such inquiries should be held in the interests of the Admiralty itself, because rumors were afloat that certain disasters were due to direct instructions from the Admiralty. He attached no credence to these rumors, but if the Admiralty recurred to the old practice they would dispose of them. The problem with which our navy had to deal was very similar to that which confronted the navy in Nelson's time. One of the dangers a hundred years ago was the attitude of neutral powers. Sea power inevitably irritated neutral states. We must respect the rights and susceptibilities of neutrals, but we were engaged in a life and death struggle, and the weapon by which we hoped to bring the war to a close was sea power. Whatever the risk, no government would be justified in giving up a single one of the rights which that sea power gave it. (Cheers.) Napoleon

tried to delay the decision of sea power, but he was driven by sea pressure to hazard it at last.

Lord Charles Beresford considered that if a joint note was presented by the Allies there would be no trouble with neutrals. He urged that inquiries should be held into the loss of the *Hogue*, the *Aboukir*, the *Cressy*, the *Hawke*, the *Hermes*, and the *Formidable*, as he considered that disasters from submarine attack were preventable, and it was very desirable that it should be known whether the Admiralty had given proper instructions to the navy as to the adoption of the necessary precautions. If the squadron in which the *Formidable* was a unit was sent to sea without the necessary safeguards, it was either criminal negligence or crass stupidity, or it was dictated by what he must describe as amateur strategy, and the country should insist upon a proper inquiry being held.—*Naval and Military Record*, 2/17.

CURRENT NAVAL AND PROFESSIONAL PAPERS

NOTE.—Lack of space limits the scope of these references. Upon application, members of the Institute will be supplied with fuller references to current periodicals published in both the United States and foreign countries.

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UNITED STATES

1. SCRIBNER'S. **March.**—The Building of the Panama Canal (I), by *Geo. W. Goethals, U. S. A.* The New Conditions in War, by *J. F. J. Archibald.* The War from an American Point of View, by *Geo. B. McClellan.* Turkey and Germany, by *H. G. Dwight.*

2. NORTH AMERICAN REVIEW. **May.**—The Government and the War, by *George Harvey.* The Neutralization of the Sea, by *Norman Angell.* The New Menace in the Far East, by *Francis Aldridge.*

3. YALE REVIEW. **April.**—England's Experience with the "Real Thing," by *L. P. Jacks, Professor of Philosophy at Oxford.* Nationality and the New Europe, by *Archibald C. Coolidge, Professor of Modern History at Harvard, Exchange Professor at Berlin last year.* Neutralization in Theory and Practice, by *George G. Wilson, of the Department of Diplomacy at Harvard, and recently Exchange Professor to France.*

4. SCIENTIFIC AMERICAN. **March 13.**—Gyrostatic Action as Applied to Torpedoes, Submarines and Aeroplanes. The Defence of Belgium by Inundation. Spherical Cars for Deep Sea Salvage. **March 27.**—Review of Progress in Radio-Telephony. An Airship in the Field. **April 3.**—Photographing Projectiles. The Submarine at Sea. The Zeppelin Question. **April 10.**—The Lincoln Beachey Monoplane. A Submarine to Salve a Sub-

marine. An Analysis of Our Naval Standing (I), by *G. von L. Meyer.* **April 17.**—Raising the *F 4.* Dum-Dum Bullets. **May 1.**—Protecting a Retreating Army. Mechanics of Convalescence. Evolution of the Etrich "Taube." The European Infantryman's Rifle—Mannlichers, Lee-Enfields, Mausers, and Other Weapons. Bullets of the Fighting Nations. Coaling United States Warships. The Rifling of Firearms. The Motor Truck in Military Service. **May 8.**—The *Queen Elizabeth.* A Mother Ship for Submarines. Hand Grenades. Italian Military Aeroplanes. Gas and Steam Engines and the Turbine. The Submarine in Naval Warfare (I).

5. SHIPPING ILLUSTRATED. **March 27.**—Storing Oil in the Sea.

6. JOURNAL OF THE MILITARY SERVICE INSTITUTION. **May-June.**—Aguinaldo's True Report of the Philippine Insurrection. The Last Battle of the Civil War. The Japanese Army (translation). Service of Armies in the Field (translation). Sonshi—The Chinese Military Classic (translation).

7. BULLETIN AMERICAN GEOGRAPHICAL SOCIETY. **March.**—Geographic Aspects of War.

8. ENGINEERING MAGAZINE. **March.**—Via Panama to Pacific Ports. Explosives in the European War. Germany's Strategic Railways (review). The Modern Submarine (review). Prevention of Fire at Sea (review).

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9. THE NINETEENTH CENTURY AND AFTER. **March.**—The Future of Constantinople, by *J. Ellis Barker.* China and the War, by *Sir Francis Piggott.* Neutrality *versus* War, by *Sir Thomas Barclay.* The Alien Enemy Within Our Gates, by *Arthur Paterson.* Germany in Peace and in War: a Glimpse from Within, by *R. S. Nolan.* Our Imperial System, by *Prof. J. H. Morgan.* Sea Freights and the Cost of Food, by *W. H. Renwick.* **April.**—The Neutral Merchant: Three American Notes and the Answers, by *Sir Francis Piggott.* Germany, Africa, and the Terms of Peace, by *Sir Harry H. Johnston.* What the Germans Did in East Africa, by *S. T. Pruen, M.D.* Voluntary or Compulsory Service? Telegraphs in War-Time, by *Charles Bright, F. R. S. E., M. Inst. C. E.* Home Railways During the War, by *H. J. Jennings.* Problems in the Near East: (1) The Territorial Ambitions of the Balkan States, by *Sir Alfred Sharpe, K. C. M. G.;* (2) Italy and Intervention, by *Gino Calza-Bedolo.*

10. THE FORTNIGHTLY REVIEW. **March.**—British and German Policy, by *Dr. J. Holland Rose.* Big States and Small Nations, by *J. A. R. Marriott.* What Has the British Navy Done? by *Archibald Hurd.* Social Democracy and Peace, by *H. M. Hyndman.* America and Her Impending Duty, by *James Davenport Whelpley.* The Campaign in the Caucasus, with Map, by *Robert Machray.* The South African Rebellion, a Letter from Cape Town, by *Spencer Campbell.* Bulgaria's Attitude, by *Frank Fox.* Nationality and Naturalization, by *Arthur A. Baumann.* Militarism and the War, by *Holford Knight.* History of the War, with Maps. **April.**—Problems of Diplomacy in the Near East, by *Outis.* The Defences of Constantinople, with Map, by *H. Charles Woods.* The Future of Turkey, by *Politicus.* The Economic Triumph of British Sea Power, by *Excubitor.* War Strength of Germany, Great Britain, and France, by *W. H. Mallock.* England, Russia, and Constantinople, by *L. B. Firth.* The Folly of Early Offers of Peace, by *Dr. J. Holland Rose.* America's Unsheathed Weapon, by *James Davenport Whelpley.* The Final Expulsion of Germany from China, by *Imperialist.* History of the War, with Maps.

11. THE CONTEMPORARY REVIEW. **March.**—Serbia Revisited, by *G. M. Trevelyan.* Turkey, Germany, and the War, by *Sir Edwin Pears.* War

Finance, by *Dr. E. J. Dillon.* Rumor and Historical Science in Time of War, by *Prof. A. F. Pollard.* The Dysgenics of War, by *Dr. C. W. Saleeby.* America and the War, by *the Rev. Dugald Macfadyen.* German Culture, by *Dr. W. A. Chapple, M. P.* Italy and Albania, by *Wadham Peacock.* War and Its Preventives, by *Percy Winfield.* **April.**—The Reconstruction of Belgium, by *Senator H. La Fontaine.* Germany as a Member of the Community of European States, by *J. A. Murray MacDonald, M. P.* Italy on the Verge, by *Dr. E. J. Dillon.* The Outlook for Neutrals, by *Sir John MacDonell, K. C. B.* International Control of Armaments, by *Sir Robert Laidlaw.* Franco-English Solidarity, by *Jean Finot.* Turkey and German Capitalists, by *Syud Hossain.*

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14. MARINE ENGINEER AND NAVAL ARCHITECT. **April.**—The Submarine (illustrated).

15. PAGE'S ENGINEERING WEEKLY. **April 23.**—The Evolution of the Submarine and Its Latest Development. Electric Propulsion of Ships. Supplying Oil to Submarines.

16. UNITED SERVICE MAGAZINE. **March.**—The Navy and the War, by *"Admiral."* Some Aspects of the Naval War, by *Percival A. Hislam.* Boat Actions and River Fights, by *Commander E. Hamilton Currey, R. N.* War Notes, by *Capt. H. M. Johnstone, R. E.* [Retired]. Egypt Under Muhammad Ali, by *Lieut. General F. H. Tyrrell.* Anglo-French Relations, by *Major General T. F. Lloyd.* Small Calibers for War, by Edward C. Crossman. **April.**—The Navy and the War, by *"Admiral."* Naval Prize in War, by *Capt.* (now *Vice Admiral*) *C. Johnstone, R. N.* Some Thoughts on England's New Military Power, by *"Rooinek."* Egypt Under the Khedivial Dynasty, by *Lieut. General F. H. Tyrrell.* Progress in Aeronautics, by *Major H. Bannerman-Phillips.*

17. INTERNATIONAL MARINE ENGINEERING. **March.**—Electric Towing System at Panama (illustrated). The Latest French Destroyers. The Old Navy and the New.

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18. RIVISTA MARITTIMA. **March.**—Commerce and the Panama Canal. International Law and the War of the Nations.

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19. REVISTA GENERAL DE MARINA. **February.**—De Reclutamiento, por *Victor M. Concas.* Los rayos ultravioletas, por *D. Jacobo Torón.* Manejo marinero de los modernos buques de guerra, por *D. Carlos Suanzes.*

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20. REVISTA MARITIMA BRAZILEIRA. **January.**—A Grande Guerra, *Augusto Vinhaes.* Os Acontecimentos Navaes, *Capitão tenente Alvaro Porto.* Em Torno da Conflagração Européa, *2º tenente E. W. Muniz Barreto.*

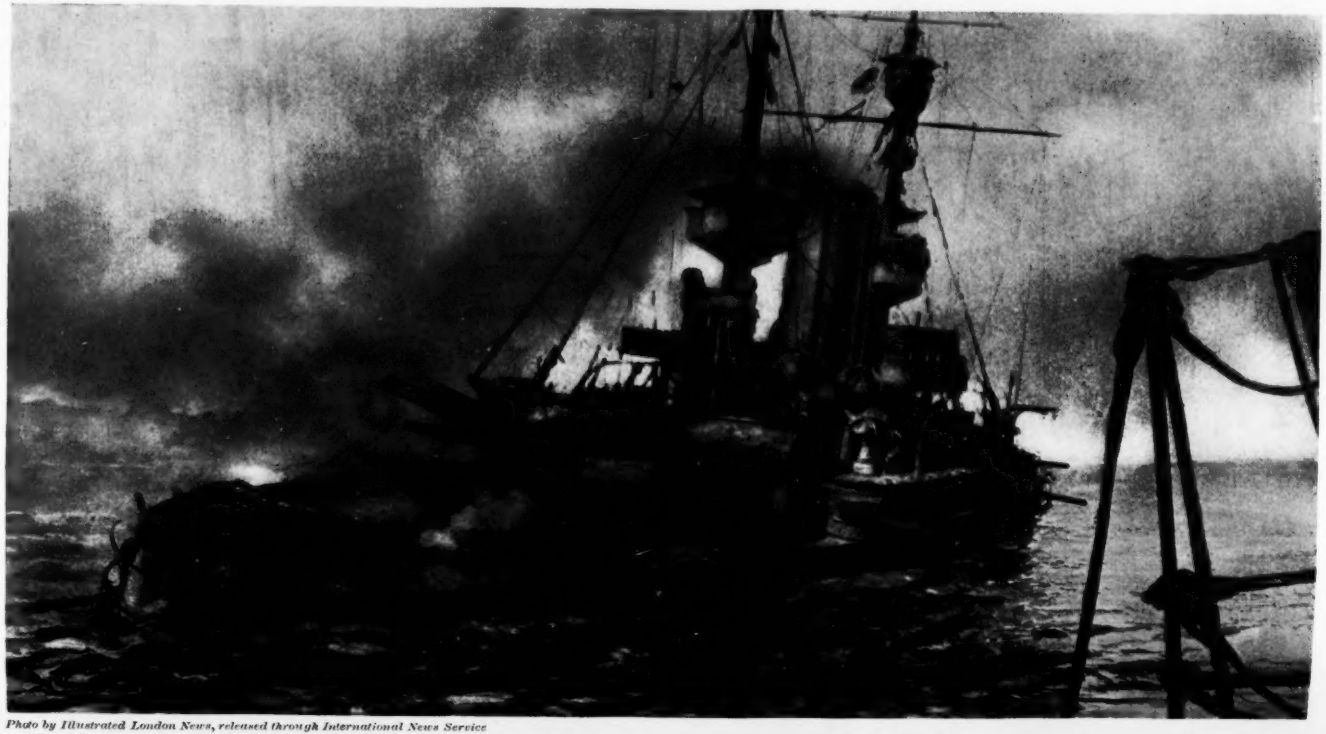

Photo by Illustrated London News, released through International News Service

A Remarkable Photograph of the Sinking of the British Battleship Irresistible on the Afternoon of March 18, After a General Attack of the British and French Fleets on the Fortresses at the Narrows of the Dardanelles

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EUROPEAN WAR NOTES

Compiled by Lieutenant C. C. Gill, U. S. Navy

GENERAL ARRANGEMENT

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DIPLOMATIC NOTES

UNITED STATES AND BELLIGERENTS

On **March 30** the American Government closed for the time being the discussion of restrictions on neutral trade by a note criticising the terms of the British Blockade Orders of **March 15.** The note sanctions a "long-range" blockade and concedes even the right to take suspected vessels into port for judicial examination; but it insists on "free admission and exit to all lawful traffic with neutral ports . . . . except contraband in transit to the enemy," and trusts that the orders will be modified in application so as to avoid violation of neutral rights.

Text of the Note to Great Britain Through the United States Secretary of State and the American Ambassador at London, Dated Washington, March 30, 1915.—You are instructed to deliver the following to His Majesty's Government in reply to your numbers 1795 and 1798 of March 15: The government of the United States has given careful consideration to the subjects treated in the British notes of March 13 and March 15, and to the British Order-in-Council of the latter date. These communicaions are matters of grave importance to neutral nations. They appear to menace their rights of trade and intercourse not only with belligerents but also with one another. They call for frank comment in order that misunderstandings may be avoided. The government of the

*Acknowledgment is made to A. F. Westcott, Ph. D., Instructor U. S. Naval Academy, for help given in making this compilation.

United States deems it its duty, therefore, speaking in the sincerest spirit of friendship, to make its own view and position with regard to them unmistakably clear.

The Order-in-Council of the 15th of March would constitute, were its provisions to be actually carried into effect as they stand, a practical assertion of unlimited belligerent rights over neutral commerce within the whole European area, and an almost unqualified denial of the sovereign rights of the nations now at peace. This government takes it for granted that there can be no question what those rights are. A nation's sovereignty over its own ships and citizens under its own flag on the high seas in time of peace is, of course, unlimited, and that sovereignty suffers no diminution in time of war, except in so far as the practice and consent of civilized nations has limited it by the recognition of certain now clearly determined rights, which it is conceded may be exercised by nations which are at war.

Free Ships Make Free Goods.—A belligerent nation has been conceded the right of visit and search, and the right of capture and condemnation, if upon examination a neutral vessel is found to be engaged in unneutral service or to be carrying contraband of war intended for the enemy's government or armed forces. It has been conceded the right to establish and maintain a blockade of an enemy's ports and coasts and to capture and condemn any vessel taken in trying to break the blockade. It is even conceded the right to detain and take to its own ports for judicial examination all vessels which it suspects for substantial reasons to be engaged in unneutral or contraband service and to condemn them if the suspicion is sustained. But such rights, long clearly defined both in doctrine and practice, have hitherto been held to be the only permissible exceptions to the principle of universal equality of sovereignty on the high seas as between belligerents and nations not engaged in war.

It is confidently assumed that His Majesty's Government will not deny that it is a rule sanctioned by general practice that, even though a blockade should exist and the doctrine of contraband as to unblockaded territory be rigidly enforced, innocent shipments may freely be transported to and from the United States through neutral countries to belligerent territory without being subject to the penalties of contraband traffic or breach of blockade, much less to detention, requisition or notification. Moreover, the rules of the Declaration of Paris of 1856— among them that free ships make free goods —will hardly at this day be disputed by the signatories of that solemn agreement.

Any Other Attitude Unneutral.—His Majesty's Government, like the government of the United States, has often and explicity held that these rights represent the best usage of warfare in the dealings of belligerents with neutrals at sea. In this connection I desire to direct attention to the opinion of the chief justice of the United States in the case of the Peterhof, which arose out of the Civil War and to the fact that the opinion was unanimously sustained in the award of the arbitration commission of 1871, to which the case was presented at the request of Great Britain. From that time to the Declaration of London of 1909, adopted with modifications by the Order-in-Council of the 23d of October last, these rights have not been seriously questioned by the British Government. And no claim on the part of Great Britain or any justification for interfering with the clear rights of the United States and its citizens as neutrals could be admitted. To admit it would be to assure an attitude of unneutrality toward the present enemies of Great Britain which would be obviously inconsistent with the solemn obligations of this government in the present circumstances; and for Great Britain to make such a claim would be for her to abandon and set at naught the principles for which she has consistently and earnestly contended in other times and circumstances.

Blockade of Neutral Ports.—The note of His Majesty's principal Secretary of State for Foreign Affairs which accompanies the Order-in-Council, and

which bears the same date, notifies the government of the United States of the establishment of a blockade, which is, if defined by the terms of the Order-in-Council, to include all the coasts and ports of Germany and every port of possible access to enemy territory. But the novel and quite unprecedented feature of that blockade, if we are to assume it to be properly so defined, is that it embraces many neutral ports and coasts, bars access to them, and subjects all neutral ships seeking to approach them to the same suspicion that would attach to them were they bound for the ports of the enemies of Great Britain and to unusual risks and penalties. It is manifest that such limitations, risks and liabilities placed upon the ships of a neutral power on the high seas, beyond the right of visit and search and the right to prevent the shipment of contraband already referred to, are a distinct invasion of the sovereign rights of the nation whose ships, trade, or commerce is interfered with.

Freedom of Lawful Traffic.—The government of the United States is, of course, not oblivious to the great changes which have occurred in the conditions and means of naval warfare since the rules hitherto governing legal blockade were formulated. It might be ready to admit that the old form of "close" blockade with its cordon of ships in the immediate offing of the blockaded ports is no longer practicable in face of an enemy possessing the means and opportunity to make an effective defence by the use of submarines, mines and air craft; but it can hardly be maintained that, whatever form of effective blockade may be made use of, it is impossible to conform at least to the spirit and principles of the established rules of war. If the necessities of the case should seem to render it imperative that the cordon of blockading vessels be extended across the approaches to any neighboring neutral port or country, it would seem clear that it would still be easily practicable to comply with the well-recognized and reasonable prohibition of international law against the blockading of neutral ports by according free admission and exit to all lawful traffic with neutral ports through the blockading cordon. This traffic would, of course, include all outward-bound traffic from the neutral country and all inward-bound traffic to the neutral country except contraband in transit to the enemy. Such procedure need not conflict in any respect with the rights of the belligerent maintaining the blockade, since the right would remain with the blockading vessels to visit and search all ships either entering or leaving the neutral territory which they were in fact, but not of right, investing.

German Acts No Excuse.—The government of the United States notes that in the Order-in-Council His Majesty's Government give as their reason for entering upon a course of action, which they are aware is without precedent in modern warfare, the necessity they conceive themselves to have been placed under to retaliate upon their enemies for measures of a similar nature which the latter have announced it their intention to adopt and which they have to some extent adopted; but the government of the United States, recalling the principles upon which His Majesty's Government have hitherto been scrupulous to act, interprets this merely as a reason for certain extraordinary activities on the part of His Majesty's naval forces and not as an excuse for or prelude to any unlawful action. If the course pursued by the present enemies of Great Britain should prove to be in fact tainted by illegality and disregard of the principles of war sanctioned by enlightened nations, it cannot be supposed, and this government does not for a moment suppose, that His Majesty's Government would wish the same taint to attach to their own actions or would cite such illegal acts as in any sense or degree a justification for similar practices on their part in so far as they affect neutral rights. It is thus that the government of the United States interprets the language of the note of His Majesty's principal Secretary of State for Foreign Affairs which accompanies the copy of the Order-in-Council which was handed to the ambassador of the United States near the Government in London and by him transmitted to Washington.

Prize Court Orders Gratifying.—This government notes with gratification that "wide discretion is afforded to the prize court in dealing with the trade of neutrals in such manner as may in the circumstances be deemed just and that full provision is made to facilitate claims by persons interested in any goods placed in the custody of the marshal of the prize court under the order"; that "the effect of the Order-in-Council is to confer certain powers upon the executive officers of His Majesty's Government"; and that "the extent to which these powers will be actually exercised and the degree of severity with which the measures of blockade authorized will be put into operation are matters which will depend on the administrative orders issued by the government and the decisions of the authorities especially charged with the duty of dealing with individual ships and cargoes according to the merits of each case." This government further notes with equal satisfaction the declaration of the British Government that "the instructions to be issued by His Majesty's Government to the fleet and to the customs officials and executive committees concerned will impress upon them the duty of acting with the utmost despatch consistent with the object in view, and of showing in every case such consideration for neutrals as may be compatible with that object, which is, succinctly stated, to establish a blockade to prevent vessels from carrying goods for or coming from Germany."

Modifications Expected.—In view of these assurances formally given to this government, it is confidently expected that the extensive powers conferred by the Order-in-Council on the executive officers of the crown will be restricted by "orders issued by the government" directing the exercise of their discretionary powers in such a manner as to modify in practical application those provisions of the Order-in-Council, which, if strictly enforced, would violate neutral rights and interrupt legitimate trade. Relying on the faithful performance of these voluntary assurances by His Majesty's Government, the United States takes it for granted that the approach of American merchantmen to neutral ports situated upon the long line of coast affected by the Order-in-Council will not be interfered with when it is known that they do not carry goods which are contraband of war or goods destined to or proceeding from ports within the belligerent territory affected.

The government of the United States assumes with the greatest confidence that His Majesty's Government will thus adjust their practice to the recognized rules of international law, because it is manifest that the British Government have adopted an extraordinary method of "stopping cargoes destined for or coming from the enemy's territory," which, owing to the existence of unusual conditions in modern warfare at sea, it will be difficult to restrict to the limits which have been heretofore required by the law of nations. Though the area of operations is confined to "European waters including the Mediterranean," so great an area of the high seas is covered and the cordon of ships is so distant from the territory affected that neutral vessels must necessarily pass through the blockading force in order to reach important neutral ports which Great Britain as a belligerent has not the legal right to blockade and which, therefore, it is presumed she has no intention of claiming to blockade. The Scandinavian and Danish ports, for example, are open to American trade. They are also free, so far as the actual enforcement of the Order-in-Council is concerned, to carry on trade with German Baltic ports, although it is an essential element of blockade that it bear with equal severity upon all neutrals. This government, therefore, infers that the commanders of His Majesty's ships of war engaged in maintaining the so-called blockade will be instructed to avoid enforcement of the proposed measures of non-intercourse in such a way as to impose restrictions upon neutral trade more burdensome than those which have been regarded as inevitable when the ports of a belligerent are actually blockaded by the ships of its enemy.

American Rights Must Be Regarded.—The possibilities of serious interruption of American trade under the Order-in-Council are so many, and the methods proposed are so unusual and seem liable to constitute so great

an impediment and embarrassment to neutral commerce that the government of the United States, if the Order-in-Council is strictly enforced, apprehends many interferences with its legitimate trade which will impose upon His Majesty's Government heavy responsibilities for acts of the British authorities clearly subversive of the rights of neutral nations on the high seas. It is, therefore, expected that His Majesty's Government, having considered these possibilities, will take the steps necessary to avoid them, and, in the event that they should unhappily occur, will be prepared to make full reparation for every act, which under the rules of international law constitutes a violation of neutral rights.

As stated in its communication of October 22, 1914, "this government will insist that the rights and duties of the United States and its citizens in the present war be defined by the existing rules of international law and the treaties of the United States, irrespective of the provisions of the Declaration of London, and that this government reserves to itself the right to enter a protest or demand in each case in which those rights and duties so defined are violated, or their free exercise interfered with by the authorities of the British Government."

In conclusion, you will reiterate to His Majesty's Government that this statement of the views of the government of the United States is made in the most friendly spirit, and in accordance with the uniform candor which has characterized the relations of the two governments in the past, and which has been in large measure the foundation of the peace and amity existing between the two nations without interruption for a century.—*Boston Evening Transcript*, 4/6.

On **April 11** the German Ambassador made public a memorandum to the United States Government criticising its attitude regarding the shipment of war munitions to the Allies and the non-shipment of foodstuffs to Germany.

The memorandum as given out was undated, but it was ascertained tonight that it was delivered to the State Department in a note signed by Count von Bernstorff, which was dated April 4. The note did not say the memorandum was being delivered by direction of the Berlin Government.

The memorandum criticises the failure of the United States to obtain the release of the cargo of the American steamship *Wilhelmina*. It condemns the inability of this government to accomplish anything in its efforts to safeguard legitimate American trade with Germany, asserts that after eight months of effort nothing has been accomplished, and characterizes this delay as equivalent to complete failure.

After thus picturing the foreign policy of the United States Government as one of futility, Count von Bernstorff's memorandum says it must be "assumed that the United States Government has accepted England's violations of international law."—*N. Y. Times*, 4/11.

The reply to Count von Bernstorff's memorandum was published on **April 21.**

Dignified and courteous in tone, but exceedingly firm in substance, the reply of the American Government repudiates the suggestion that the administration has failed in its obligations as a neutral state, and patiently endeavors to dissipate "certain false impressions" of the German Ambassador. An interesting passage of the communication deals with the question of the export of munitions of war from the United States to the Allied countries. On this matter it is explicitly asserted that "This Government holds . . . that any change in its own laws of neutrality during the progress of a war, which would affect unequally the relations of the United States

with the nations at war, would be an unjustifiable departure from the principle of strict neutrality." No official comment has, as we write, been made upon the communication by the German Foreign Office. The *Morgenpost*, of Berlin, reflects the tone of unofficial comment in the German press when it says: "This answer sounds like a mockery of the German standpoint . . . it remains for Mr. Bryan to proclaim with such cynical frankness that the weapon trade to one belligerent is real neutrality."—*N. Y. Nation*, 4/29.

DR. DERNBURG'S LETTER.—A letter written by Dr. Bernhard Dernburg and read on April 17 at a meeting in Portland, Me., has attracted attention as possibly inspired from higher sources. The letter, according to the *N. Y. Times* (April 19) makes the following suggestions:

1. The freedom or neutralization of the high seas in time of war.
2. An open-door policy regarding colonies, under which German trade with the colonies of other empires, notably the British, would not be hampered by the preferential tariffs now accorded the mother country.
3. Failing the grant of demands 1 and 2 and the smoothing of the German paths of commerce through Belgium without British interference, Germany's retention of Belgium as a natural foreland and commercial doorway to the western seas.
4. The safety, which would seem to mean now the return to Germany, of German colonies, into which Germany could pour her increasing population.
5. A free hand for German activity along lines already tapped in Asia Minor and Africa.

BRITISH NAVALISM.—It is obvious that, after the close of this war, even if we assume the success of the Allies, there is likely to be no field in which the change will be greater than in that of ocean sway. The apparent passing of the dreadnought and the coming of the submarine (to mention no other cause) seem to make this inevitable. It is hardly likely that Britannia's command of the ocean will ever be quite so far-reaching or undisputed as it has been in the past, unless some very unforeseen developments take place. So far as present conditions indicate, the policing of the seas will probably have to pass from the trustee to the board of directors. Delegation will have to give way to cooperation. All the great naval powers will have to unite in the task; and not the least prominent rôle will fall to the lot of the United States, convinced of the necessity of free trade and free shipping. And no doubt the new laws of the sea will be laid down very largely on the lines which the United States has always advocated in such matters as the protection of cargoes by the neutral flag. . . .

Count Hermann Keyserling has recently pointed out that the old formulas (still generally accepted on the continent of Europe) of British "mercantilism" and "disregard of other nations' rights" have long ceased to be adequate and are now merely misleading. Among the many proofs of this is the absolutely open door we show to foreign traders both at home and in our colonies. British South Africa owes a good deal of its prosperity to the German merchants who by deliberate preference have taken refuge there from the armed sentries and omnipresent uniforms of the neighboring German colonies. Indeed, so impressed by this state of affairs was a friend of mine from Cape Colony that he used to assert (with at least a certain amount of serious intent) that if Germany ever defied the Monroe Doctrine and seized Brazil, one of the immediate results would be the migration of the German settlers in Brazil to the colonies of some less bureaucratic country than their own fatherland.—J. F. MUIRHEAD, *The Nation*, 5/6.

INTERNMENT OF GERMAN RAIDERS.—The German auxiliary cruiser *Prinz Eitel Friedrich* was interned at Norfolk Navy Yard on April 9. On March 20, ten days after her arrival, the *Eitel* was granted a period of fourteen

working days for repairs, to close at midnight on April 7. In the meantime a force of enemy cruisers was held off the Virginia Capes. The decision of Commander Thierchens to intern was not communicated until April 7.

On April 11 the German auxiliary cruiser *Kronprinz Wilhelm* anchored off Newport News. The *Kronprinz* left New York August 3 as a German passenger steamer; took officers, guns, and stores from the *Karlsruhe* off Bermuda; and sank 14 vessels valued with their cargoes at $7,000,000 during her cruise in the South Atlantic.

By keeping the sea for such long periods, and evading capture or destruction, the commanders of both the *Prinz Eitel Friedrich* and the *Kronprinz Wilhelm* have helped to make traditions for the German Navy aside from their successful work as commerce destroyers. Assuming that the *Karlsruhe* has been destroyed, there remains only one commerce raider—the *Strassburg*, to be accounted for. Her fate is quite as mysterious as that of the *Karlsruhe*, although circumstantial reports indicate that the latter cruiser was wrecked or blown up in the West Indies. There is no doubt that the Germans had mapped out careful plans for their swift cruisers long before the war began and they were remarkably successful in keeping them supplied with coal and provisions. It is apparent also that they were able to communicate freely by wireless with the raiders. Without a permanent base in the Atlantic, the raiders managed nevertheless, to make a good deal of trouble for the allied cruisers, and by avoiding an engagement they conserved their ammunition supplies, which could not be replaced.—*Nautical Gazette*, 3/28.

DAMAGES IN "FRYE" CASE.—In reply to an American note dated April 3, presenting claims for the sinking of the American merchant vessel *William P. Frye* by the *Eitel Friedrich* on January 27, the German Government in a note dated April 4 agreed to pay for both ship and cargo, basing its action, however, not on modern international law (according to which it justified the action), but on old commercial treaties between the United States and Prussia dated 1799 and 1828, and providing that no contraband belonging to either party should be confiscated. The last paragraph of the German Note was as follows: "On the ground of the treaty stipulation, which is, as a matter of course, binding on the German prize court, the American owners of ship and cargo would receive compensation even if the court should declare the cargo of wheat to be contraband. Nevertheless, the approaching prize proceedings are not rendered superfluous, since the competent prize court must examine into the legality of the capture and destruction, and also pronounce upon the standing of the claimants and the amount of the indemnity."

In reply to this last statement, the Washington government (April 28) suggested the advisability of transferring further negotiations to the German Embassy at Washington. Later (May 19), on learning that the *Frye* case had been ordered before the prize court at Hamburg, it directed inquiries through Ambassador Gerard as to whether this action was to be taken as an answer to the Note of April 28 or had been ordered before its receipt.

"WILHELMINA" CASE SETTLED.—Under the basis of settlement now agreed upon the *Wilhelmina's* cargo will be requisitioned by the British Government and the owners reimbursed for the delay occasioned by sending the case before the prize court. The prize court proceedings, which were originally instituted in an effort to prove that the cargo of the *Wilhelmina* was destined for the armed forces of Germany, have been virtually abandoned.

The British Government found itself unable to prove that the *Wilhelmina's* cargo was going to the enemy's forces, but, being unwilling to permit the cargo to go to Germany, has resorted to the old law of Anaria, which dates back to feudal days, and under which goods within belligerent territory may be requisitioned for the use of the government and paid for by that government.

Through the compromise the British Government avoids a court decision, which might have been extremely distasteful to Great Britain in future years. Had the prize court condemned the *Wilhelmina's* cargo, Great Britain would have been on record as having made food to the civil population of a belligerent country absolute contraband, a position at direct variance with the policy of the country in the past.—*N. Y. Times*, 4/13.

"DACIA" CASE.—The French Ministry has prepared a bill providing for the purchase of cargoes belonging to neutrals and in transit to belligerents. The bill will contain an authorization to pay for the cargo of cotton on board the former Hamburg-American Line steamer *Dacia*, which was seized by a French cruiser while on a voyage from Galveston for Rotterdam and was taken into Brest on February 27.

ATTACK ON THE CUSHING.—On April 28 the American steamer *Cushing* was attacked by a German biplane, 25 miles from Antwerp and 8 miles from the West Hinder light ship. According to the statement of Captain Herland (*N. Y. Herald*, May 19): "There was ample light for the pilot of the biplane to see the words, '*Cushing*, New York, United States of America' painted on each side of the vessel in letters 8 feet high, and to note the stars and stripes at the mast head and taffrail." Three bombs were thrown, all of which struck close to the ship.

"GULFLIGHT" TORPEDOED.—The American tank steamer *Gulflight*, bound from Port Arthur, Texas, to Rouen with a cargo of oil, was torpedoed on May 1 off the Scilly Islands. The ship, badly down by the head, was towed into Crow Sound, Scilly Islands. Two of the crew who jumped overboard were drowned. The ship at the time was accompanied by two British patrol vessels.

It has been determined to ascertain all the circumstances of the attack before a plan of procedure is framed, and to that end inquiries will be sent to James W. Gerard, the American Ambassador in Berlin, and to some official source in England, probably Walter H. Page, the American Ambassador in London.—*N. Y. Times*, 5/4.

THRASHER CASE.—In regard to the loss of the American citizen Leon Chester Thrasher when the British steamship *Falaba* was torpedoed on March 28 by a German submarine, although no communication has as yet been addressed to the German Government on the subject, the latter apparently took time by the forelock by addressing on April 6 an "official message from Berlin" to the German Embassy in Washington, pointing out that neutral passengers on board British ships were warned in due time not to cross the "war zone," and the German Government was therefore not responsible for anything that might happen to them.—*N. Y. Nation*, 4/15.

On **May 7** the Cunarder *Lusitania* was sunk by a submarine off Kinsdale Head on the south coast of Ireland; about 1200 persons were reported lost. Of 188 Americans on board 102 were lost. While the *Lusitania's* cargo included large quantities of war munitions, it is denied by British authorities that the vessel was armed.

and this statement is supported by Collector Malone's report regarding her inspection at New York.

The American Note to Germany (**May 13**) was as follows:

In view of recent acts of the German authorities in violation of American rights on the high seas, which culminated in the torpedoing and sinking of the British steamship *Lusitania* on May 7, 1915, by which over one hundred American citizens lost their lives, it is clearly wise and desirable that the Government of the United States and the Imperial German Government should come to a clear and full understanding as to the grave situation which has resulted.

The sinking of the British passenger steamer *Falaba* by a German submarine on March 28, through which Leon C. Thrasher, an American citizen, was drowned; the attack on April 28 on the American vessel *Cushing* by a German aeroplane; the torpedoing on May 1 of the American vessel *Gulflight* by a German submarine, as a result of which two or more American citizens met their death; and, finally, the torpedoing and sinking of the steamship *Lusitania*, constitute a series of events which the Government of the United States has observed with growing concern, distress and amazement.

Recalling the humane and enlightened attitude hitherto assumed by the Imperial German Government in matters of international right and particularly with regard to the freedom of the seas; having learned to recognize the German views and the German influence in the field of international obligation as always engaged upon the side of justice and humanity; and having understood the instructions of the Imperial German Government to its naval commanders to be upon the same plane of humane action prescribed by the naval codes of other nations, the Government of the United States was loath to believe—it cannot now bring itself to believe—that these acts, so absolutely contrary to the rules, the practices, and the spirit of modern warfare, could have the countenance or sanction of that great government.

It feels it to be its duty, therefore, to address the Imperial German Government concerning them with the utmost frankness and in the earnest hope that it is not mistaken in expecting action on the part of the Imperial German Government which will correct the unfortunate impressions which have been created and vindicate once more the position of that government with regard to the sacred freedom of the sea.

The Government of the United States has been apprised that the Imperial German Government considered themselves to be obligated by the extraordinary circumstances of the present war and the measures adopted by their adversaries in seeking to cut Germany off from all commerce, to adopt methods of retaliation which go much beyond the ordinary methods of warfare at sea, in the proclamation of a war zone from which they have warned neutral ships to keep away.

This Government has already taken occasion to inform the Imperial German Government that it cannot admit the adoption of such measures or such a warning of danger, to operate as in any degree an abbreviation of the rights of American shipmasters or of American citizens bound on lawful errands as passengers on merchant ships of belligerent nationality; that it must hold the Imperial German Government to a strict accountability for any infringement of these rights, intentional or incidental.

It does not understand the Imperial German Government to question those rights. It assumes on the contrary, that the Imperial German Government accept as of course the rule that the lives of non-combatants, whether they be of neutral citizenship or citizens of one of the nations at war, cannot lawfully or rightfully be put in jeopardy by the capture or destruction of an unarmed merchantman, and recognize also, as all

other nations do, the obligation to take the usual precaution of visit and search to ascertain whether a suspected merchantman is in fact of belligerent nationality or is in fact carrying contraband of war under a neutral flag.

The Government of the United States therefore desires to call the attention of the Imperial German Government with the utmost earnestness to the fact that the objection to their present method of attack against the trade of their enemies lies in the practical impossibility of employing submarines in the destruction of commerce without disregarding those rules of fairness, justice and humanity which all modern opinion regards as imperative.

It is practically impossible for the officers of a submarine to visit a merchantman at sea and examine her papers and cargo. It is practically impossible for them to make a prize of her; and if they cannot put a prize crew on board of her they cannot sink her without leaving her crew and all on board of her to the mercy of the sea in her small boats. These facts, it is understood, the Imperial German Government frankly admit.

We are informed that in the instances of which we have spoken, time enough for even that poor measure of safety was not given, and in at least two of the cases cited, not so much as a warning was received. Manifestly submarines cannot be used against merchantmen, as the last few weeks have shown, without an inevitable violation of many sacred principles of justice and humanity.

American citizens act within their indisputable rights in taking their ships and in travelling wherever their legitimate business calls them upon the high seas, and exercise those rights in what should be the well justified confidence that their lives will not be endangered by acts done in clear violation of universally acknowledged international obligations and certainly in the confidence that their own Government will sustain them in the exercise of their rights.

There was recently published in the newspapers of the United States, I regret to inform the Imperial German Government, a formal warning purporting to come from the Imperial German Embassy at Washington addressed to the people of the United States and stating in effect that any citizen of the United States who exercised his right of free travel upon the seas would do so at his peril if his journey should take him within the zone of waters within which the Imperial German Navy was using submarines against the commerce of Great Britain and France, notwithstanding the respectful but very earnest protest of his government, the Government of the United States.

I do not refer to this for the purpose of calling the attention of the Imperial German Government at this time to the surprising irregularity of a communication from the Imperial German Embassy at Washington addressed to the people of the United States through the newspapers, but only for the purpose of pointing out that no warning that an unlawful and inhumane act will be committed can possibly be accepted as an excuse or palliation for that act or as an abatement of the responsibility for its commission.

Long acquainted as this government has been with the character of the Imperial German Government and with the high principles of equity by which they have in the past been actuated and guided, the Government of the United States cannot believe that the commanders of the vessels which committed these acts of lawlessness did so except under a misapprehension of the orders issued by the Imperial German naval authorities.

It takes it for granted that, at least within the practical possibilities of every such case, the commanders even of submarines were expected to do nothing that would involve the lives of non-combatants or the safety of neutral ships, even at the cost of failing of their object of capture or destruction. It confidently expects, therefore, that the Imperial German Government will disavow the acts of which the Government of the United States complains, that they will make reparation, so far as reparation

is possible, for injuries which are without measure, and that they will take immediate steps to prevent the recurrence of anything so obviously subversive of the principles of warfare for which the Imperial German Government have in the past so wisely and so firmly contended.

The Government and people of the United States look to the Imperial German Government for just, prompt and enlightened action in this vital matter with the greater confidence because the United States and Germany are bound together not only by special ties of friendship but also by the explicit stipulations of the treaty of 1828 between the United States and the Kingdom of Prussia.

Expressions of regret and offers of reparation in case of the destruction of neutral ships sunk by mistake, while they may satisfy international obligations, if no loss of life results, cannot justify or excuse a practice the natural and necessary effect of which is to subject neutral nations and neutral persons to new and immeasurable risks.

The Imperial German Government will not expect the Government of the United States to omit any word or any act necessary to the performance of its sacred duty of maintaining the rights of the United States and its citizens and of safeguarding their free exercise and enjoyment.

WASHINGTON, May 13, 1915. BRYAN.

—*N. Y. Sun*, 5/14.

REPLY CONCILIATORY.—According to a Berlin report of May 19, the rough draft of the reply is all but completed; it is conciliatory in tone and indicates that Germany is willing to do everything possible to avoid friction or complications with America, except to end her submarine warfare against England.

This rough draft probably will be laid before a conference in the Foreign Office for discussion and possible changes.—*N. Y. World*, 5/21.

On May 1 and again on May 8 the following advertisement appeared in American papers:

Notice.—Travelers intending to embark on the Atlantic voyage are reminded that a state of war exists between Germany and her allies and Great Britain and her allies; that the zone of war includes the waters adjacent to the British Isles; that in accordance with formal notice given by the Imperial German Government, vessels flying the flag of Great Britain or of any of her allies are liable to destruction in those waters and that travelers sailing in the war zone on ships of Great Britain or of her allies do so at their own risk. IMPERIAL GERMAN EMBASSY.

Washington, D. C., April 22, 1915.

Bearing on both the Thrasher case and the loss of the *Lusitania*, is a passage in the note to Germany of February 10, stating that if a German war vessel should destroy on the high seas an American vessel or the lives of American citizens, "it would be difficult for the Government of the United States to view the act in any other light than as an indefensible violation of neutral rights which it would be hard, indeed, to reconcile with the friendly relations now so happily subsisting between the two governments."

BRITISH APOLOGY TO CHILI

To an energetic protest from Chili (March 26) regarding the sinking of the *Dresden*, Sir Edward Grey replied as follows:

FOREIGN OFFICE, March 30, 1915.

Sir.—His Majesty's Government, after receiving the communication from the Chilean Government of March 26, deeply regret that any misunderstanding should have arisen which should be a cause of complaint to the Chilean Government; and, on the facts as stated in the communication made to them, they are prepared to offer a full and ample apology to the Chilean Government.

His Majesty's Government, before receiving the communication from the Chilean Government, could only conjecture the actual facts at the time when the *Dresden* was discovered by the British squadron; and even now they are not in possession of a full account of his action by the captain of the *Glasgow*. Such information as they have points to the fact that the *Dresden* had not accepted internment, and still had her colors flying and her guns trained. If this was so, and if there were no means available on the spot and at the moment for enforcing the decision of the Chilean authorities to intern the *Dresden*, she might obviously, had not the British ships taken action, have escaped again to attack British commerce. It is believed that the island where the *Dresden* had taken refuge is not connected with the mainland by cable. In these circumstances, if the *Dresden* still had her colors flying and her guns trained, the captain of the *Glasgow* probably assumed, especially in view of the past action of the *Dresden*, that she was defying the Chilean authorities and abusing Chilean neutrality, and was only awaiting a favorable opportunity to sally out and attack British commerce again.

If these really were the circumstances, His Majesty's Government cannot but feel that they explain the action taken by the captain of the British ship; but, in view of the length of time that it may take to clear up all the circumstances and of the communication that the Chilean Government have made of the view that they take from the information they have of the circumstances, His Majesty's Government do not wish to qualify the apology that they now present to the Chilean Government.

I have, &c.,

E. GREY.

—*London Times*, 4/16.

JAPAN AND CHINA

The ultimatum presented by Japan to China on **May 7** modified the original demands by withholding for future discussion the whole of Group V. China acceded to these demands, as thus modified, without qualification.

CHINA'S HELPLESSNESS.—Now that Japan at the last moment has consented to withdraw Article V of her demands upon China, a peaceable conclusion of "negotiations" that are unmatched in modern diplomacy becomes at once a probability. That was the article in which the Chinese Republic was asked to surrender sovereignty in its own affairs. It contained several stipulations, one of which, the most humiliating of all, provided that Japanese advisers should be received into the political, financial, and military councils of the Chinese. In withdrawing that article Japan was probably moved much more by signs of unfriendly opinion outside of Asia, especially in Great Britain and the United States, than by any threat on the part of the Chinese to offer physical resistance. That was hardly to be considered.—*N. Y. Times*, 5/7.

REVISED PROVISIONS OF GROUP V.—Article 1 of Group V requires that when any important crisis arises China shall ask Japan to appoint "many Japanese advisers."

Article 2 requires the right either to rent or lease lands, and would have the effect of opening the entire country to the Japanese individually, as well as under religious societies.

Article 3 now requires the appointment of police advisers and also joint Chino-Japanese tribunals for land disputes in Manchuria, besides ex-territoriality, to which the Japanese, like other foreigners, were everywhere privileged.

The new requirement of Article 4 is that China shall send a delegation of military men to Japan to adopt a procedure for the purchase of arms and the conduct of China's arsenals.

Article 5 says that China must grant to Japan the right to build the railways demanded, subject to Japan reaching an arrangement with an unnamed power (Great Britain); or she must grant Japan these concessions unless it can be shown that they have already been granted to another power. The railways in question are lines connecting Wu-Chang with Kiu-Kiang and Nan-Chang, between Nan-Chang and Kiao-Chou.

Article 6 of Group V as amended, says that China must give Japan a pledge that no foreign power shall receive a concession, and that no foreign capital shall be employed in the Province of Fukien without Japan's consent.

Regarding Buddhism, as set forth in Article 7, China must recognize Japan's right to discuss this at a future date.

New Mongolian Demands.—The four articles in the new Mongolia group provide: First, no foreign loans may be secured by Mongolian taxes without Japan's consent; second, no railway concessions can be granted without Japan's consent; third, the opening of a number of treaty ports is required; fourth, farming privileges to last a year.

Japan has already obtained concessions for the construction of four railways in Mongolia.

WASHINGTON, May 7.

The State Department issued to-day this statement on the attitude of the United States toward the Chino-Japanese negotiations:

In order that there may be no misunderstanding of the position of the United States in reference to the negotiations pending between Japan and China the following announcement is made:

At the beginning of negotiations the Japanese Government confidentially informed this government of the matters which were under discussion, and accompanied the information by the assurance that Japan had no intention of interfering with either the political independence or territorial integrity of China, and that nothing that she proposed would discriminate against other powers having treaties with China or interfere with the "open door" policy to which all the leading nations are committed.

This government has not only had no thought of surrendering any of its treaty rights with China, but it has never been asked by either Japan or China to make any surrender of these rights. There is no abatement of its interest in the welfare and progress of China, and its sole interest in the present negotiations is that they may be concluded in a manner satisfactory to both nations and that the terms of the agreement will not only contribute to the prosperity of both of these great Oriental empires, but maintain that cordial relationship so essential to the future of both and to the peace of the world.—*Boston Transcript*, 5/7.

LONDON, May 5.

Asked by a member from the floor for a statement of the progress of the negotiations between China and Japan, Sir Edward Grey said that Great Britain had been in communication with the Japanese Government on the subject of the Anglo-Japanese agreement generally, and particularly concerning those British interests which might possibly conflict with the competing Japanese demands upon China. These negotiations, however, he said, were strictly confidential.

Asked if he were going to do nothing "until Japan, by military force, having already 60,000 troops in China, had imposed her authority on China," and whether Great Britain was not bound by treaty to defend the integrity of China, or if he "was prepared to regard that simply as a scrap of paper," Sir Edward Grey reiterated that the communications made to him by Japan were confidential and that he, therefore, was not at liberty to discuss the actual terms of the Japanese demands.

The secretary said he was not aware that any official and accurate version of the demands had as yet been published and that he regarded the matter as one of the greatest importance.

The question as to how Japan can reconcile some of her demands upon China with her professed intention of upholding the independence of that country is asked by *The Manchurian Guardian* in reviewing editorially the Chino-Japanese negotiations.

"China does agree," says *The Guardian*, "to the request that she shall not cede to a third power any harbors, bays or islands among her coasts—an undertaking against which nothing can be said except that it apparently leaves Japan free to demand from China just what China is forbidden to grant to a third party.

In an outspoken editorial article, *The Daily London News* of April 29, vigorously condemns Japan's attitude toward China. It says:

"Japan's demands in their new as in their old form invite the threefold judgment that they conflict with the established rights of other powers, they violate the principle of equal rights, and they are inconsistent with either the integrity or sovereignty of China. The net effect of acceptance by China would be that China would in time become something very like a dependency of Japan, and Japan would have it in her power to drive a wedge between north and south and deny at pleasure to a central government military means of asserting its authority.

"Now that the Foreign Office has so far unbent as to allow us to know what is being demanded of China, perhaps it will unbend a little further and let the country know how it regards those demands. Not only are British material interests involved, but also our relations with regard to other countries.

"There need be no surprise that the Chinese are disappointed at the revised version, which does not fit in with Count Okuma's hints of serious modifications. There is not a people in the world, however mild in temper, which would not be stirred to its depths by such demands as Japan is now pressing. The European War has given Japan a tempting opportunity and possibly no other great power would have resisted it, but there is a wisdom in moderation as well as in promptitude, and the Japanese Government would do well to consider whether it is taking a long view in exploiting its chance so mercilessly. There is the future as well as the present to be taken into the reckoning."

THE NEW MENACE IN THE FAR EAST.—(Excerpts from an article by Francis Aldridge in the April *North American Review*.)—Barely four months had passed since the outbreak of the war when Japan put forward the suggestion that she would abandon to Australia all the islands south of the equator, on consideration of being allowed to retain those to the north. This would of course give her the possession of the Marshall Islands and of the Carolines, but would not sanction the retention of Samoa. To this the United States is understood to have objected, so Japan retained and still retains control of all of them. For the present the matter stands over for final settlement.

There is no doubt that Japan is not at the present moment supporting the Anglo-Japanese Alliance from love of England; she has pushed herself into a place in the Entente and intends to make the most of it during the fighting and thus secure a predominant voice in the final Conference. Great Britain will then have to acquiesce—or will be asked to acquiesce—in any concessions which are not at British expense in order to avoid ones which are. . . . There is no doubt whatever in the minds of Far Eastern experts that the ultimate object of Japan is to replace Great Britain in their own interests as the leading power in Asia, and that they are now starting on their policy to reach that end.

The record of Japan holds out but little hope that she will adopt a very tolerant policy toward China, though much depends on the attitude of the

United States. British Foreign Office policy is "feeling its way" doubtfully. Not a few people anticipate that at the end of the war Japan will offer to give up all the Pacific islands she has captured for a free hand in China. Such a free hand would be fatal to the trade both of the United States and Great Britain. It would hit Germany less hard.

In South Manchuria under the present conditions there is no room for the Japanese laborer; there is, however, opportunity for capital and the skilled laborer. The Japanese cannot compete with the Chinese laborer, as may clearly be seen from the following statistics, compiled by the South Manchurian Railway Company in 1913:

	Factory	Harbor	Mining
Working hours, Japanese	10.9	10.8	10.8
Wages, per day, Japanese	$0.68	$0.53	$0.56
Working hours, Chinese	11	11	11
Wages per day, Chinese	$0.25	$0.23	$0.18

There are no prospects for Japanese retailers, who are gradually pushed aside by Chinese, whose lower cost of living as well as keener sense in calculation enables them to outdo the Japanese in this line. For instance, in the streets about the locomotive works at Shakako of the south Manchurian Railway there are no Japanese retailers, despite the fact that residing there are 2500 Japanese whose everyday needs are supplied by Chinese retailers.

Under these circumstances the only way open for Japanese immigrants is farming, but unfortunately this is not practicable in the present state of affairs, for, as a matter of fact, the only territories in Manchuria which serve Japan's colonization purposes are the Kwangtung Peninsula and the land belonging to the South Manchurian Railway Company.

No wonder, then, that not the slightest result has been attained toward the solution of the most serious problem Japan has ever had to face—the relief of overcrowding at home. Should South Manchuria be developed by Japanese farmers, employing all their skill, scientifically attained, for the best use of the soil, the result would be greatly to the benefit of China and Japan, as well as other powers interested in trade in China, which has been the case in Korea since the Japanese occupation. Unless the Japanese are able to acquire freedom of residence and the right to own land, this cannot be accomplished.—*N. Y. Times*, 5/7.

MUTINY IN INDIA.—The *London Times* of April 1 gives an account of a mutiny at Singapore on February 15 of the 5th Light Infantry of an Indian regiment. Not more than half of the regiment was implicated. The mutiny was put down by loyal troops in the city, about 150 volunteers, and sailors from H. M. S. *Cadmus*. Men were later landed from the Russian cruiser *Aurel*, the French cruiser *Montcalm*, and the Japanese cruiser *Tsushima*. According to a statement made in Parliament by Mr. Harcourt, 35 British subjects were killed. Seventeen German prisoners escaped, of whom six were afterward captured. Several of the prisoners were from the *Emden*.

A communication from Straits Settlements (March 8) details reports of native disorder at Cawnpore and Rangoon and of the assassination of the Ameer of Afghanistan, accompanied by raids of the hill tribes on the Afghan border.

FINANCING RUSSIA

PETROGRAD, April 12.

Russia is to draw upon Great Britain and France for war funds to the extent of $250,000,000, one-half of this sum to be furnished by each nation, for which they are to receive the equivalent in grain. This is one of the results of the agreement reached recently in Paris by the Finance Ministers

of the three Allies to pool all the expenses of the war, as revealed by Pierre L. Bark, Minister of Finance, in an interview he granted to-day to a correspondent of *The Associated Press.—N. Y. Times*, 4/13.

ITALY

On **May 13** the Salandra Ministry resigned, apparently following its rejection of Austrian concessions, and as a protest against opposition to its policy on the part of former Premier Giolitti and his adherents. Popular demonstrations were followed on **May 15** by the decision of the King to retain the Salandra Cabinet. When convened on **May 20**, the Chamber of Deputies, by a vote of 407 to 74, passed the bill introduced by Premier Salandra conferring full powers upon the Ministry in the event of war and during its continuance. On **May 24**, Italy declared war on Austria.

TEXT OF THE FORMAL DECLARATION OF WAR PRESENTED BY ITALY TO AUSTRIA-HUNGARY

VIENNA, May 23 (via Amsterdam and London, May 24).

The Duke of Avarna, Italian Ambassador to Austria, presented this afternoon to Baron von Burian, the Austro-Hungarian Foreign Minister, the following declaration of war:

VIENNA, May 23, 1915.

Conformably with the orders of His Majesty the King, His august Sovereign, the undersigned Ambassador of Italy has the honor to deliver to His Excellency, the Foreign Minister of Austria-Hungary, the following communication:

"Declaration has been made, as from the fourth of this month, to the Imperial and Royal Government of the grave motives for which Italy, confident in her good right, proclaimed annulled and henceforth without effect her treaty of alliance with Austria-Hungary, which was violated by the Imperial and Royal Government, and resumed her liberty of action in this respect.

"The Government of the King, firmly resolved to provide by all means at its disposal for safeguarding Italian rights and interests, cannot fail in its duty to take against every existing and future menace measures which events impose upon it for the fulfillment of national aspirations.

"His Majesty the King declares that he considers himself from to-morrow in a state of war with Austria-Hungary."

The undersigned has the honor to make known at the same time to His Excellency, the Foreign Minister, that passports will be placed this very day at the disposal of the Imperial and Royal Ambassador at Rome, and he will be obliged to His Excellency if he will kindly have his passports handed to him.

AVARNA.

PREMIER SALANDRA'S ADDRESS.—Signor Salandra brought out clearly the point made in the Green Book, that Austria, by becoming the aggressor against Serbia, had imperilled Italy's position in disturbing the status quo in the Balkans, as well as bringing on the European conflagration, and that Austrian Ministers had acknowledged Italy's claim, in the circumstances, and under the Triple Alliance treaty, to compensation.

In spite of Austria's plain violation of the Triple Alliance treaty, the Premier said, Italy had endeavored for many months to avoid a conflict, but these endeavors had reached a limit in time and dignity, and on May 4 Italy had denounced the Triple Alliance treaty. At this point the Premier was again interrupted by an outburst of cheers.

"Italy must be united," Signor Salandra resumed, "at this moment when her destinies are being decided." The deputies unanimously rose to their feet.

It was noticed, none the less, that the Socialist members took no part in the applause.

Premier Salandra continued: "Since Italy's resurrection as a state she has asserted herself in the world of nations as a factor of moderation, concord and peace, and she can proudly proclaim that she has accomplished this mission with a firmness which has not wavered before even the most painful sacrifices.

"In the last period, extending over 30 years, she maintained her system of alliances and friendships chiefly with the object of thus assuring European equilibrium and, at the same time, peace.

"In view of the nobility of this aim, Italy not only subordinated her most sacred aspiration, but has also been forced to look on, with sorrow, at the methodical attempts to suppress specifically the Italian characteristics which nature and history imprinted on those regions.

"The ultimatum which the Austro-Hungarian Empire addressed last July to Serbia annulled at one blow the effects of a long-sustained effort by violating the pact which bound us to that state, violated the pact in form, for it failed to conclude a preliminary agreement with us or even give us notification, and violated it also in substance, for it sought to disturb, to our detriment, the delicate system of territorial possessions and spheres of influence which had been set up in the Balkan Peninsula.

"But, more than any particular point, it was the whole spirit of the treaty which was wronged, and even suppressed, for by unloosing in the world a most terrible war, in direct contravention of our interests and sentiments, the balance which the Triple Alliance should have helped to assure was destroyed, and the problem of Italy's national integrity was virtually and irresistibly revived.

"Nevertheless, for long months the government has patiently striven to find a compromise with the object of restoring to the agreement the reasonable being which it had lost. *These negotiations were, however, limited not only by time, but by our national dignity. Beyond these limits, the interests both of our honor and of our country would have been compromised.*"

According to a statement by Chancellor von Bethmann-Hollweg in the Reichstag on May 18, the concessions offered by Austria and rejected by Italy were as follows:

"First—Part of the Tyrol inhabited by Italians was to be ceded to Italy.

"Second—The western bank of the Isonzo, in so far as the population was purely Italian, and the town of Gradisca, likewise was to be ceded to Italy.

"Third—Trieste was to be made an imperial free city, receiving an administration which would insure the Italian character of the city and to have an Italian university.

"Fourth—Italian sovereignty over Avlona (a seaport of Albania) and a sphere of interest belonging thereto, to be recognized.

"Fifth—Austria-Hungary declared her political disinterestedness regarding Albania.

"Sixth—The national interests of Italians in Austria to be particularly respected.

"Seventh—Austria-Hungary to grant amnesty to political military prisoners belonging to the ceded territory.

"Eighth—The further wishes of Italy regarding the general question to be assured every consideration.

"Ninth—Austria-Hungary, after the conclusion of the agreement, to give a solemn declaration concerning the concessions.

"Tenth—Mixed committees for the regulation of the details of the concessions to be appointed.

"Eleventh—After the conclusion of the agreement Austro-Hungarian soldiers, natives of the occupied territories, shall not further participate in the war.

"I can add," continued the Imperial Chancellor, "that Germany, in order further to strengthen the understanding between both her allies, undertook, with the full agreement of the Vienna Cabinet, to give a full guarantee for the loyal fulfillment of these offers. Germany and Austria-Hungary herewith formed a resolution which, if it should lead to results, would, I firmly believe, find an overwhelming majority in the three nations.

"With its Parliament, the Italian people will now decide whether it will reach the fulfillment of all national aspirations in the widest extent in a peaceful manner, or whether it will plunge the country into war and to-morrow draw the sword against its allies of yesterday and to-day.

"I will not give up the hope entirely that the scale of peace will be heavier than the scale of war, but whatever the decision of Italy may be, we, together with Austria-Hungary, have done all within the bounds of possibility to support an alliance which was firmly rooted among the German people and had brought profit and good to the three empires. If the alliance is torn by one of the three partners we shall know, together with the other partner, how to meet the new dangers with dauntless confidence and courage."—*N. Y. Times*, 5/19.

FUTURE CONTROL OF CONSTANTINOPLE.—It is practically certain that Russia will not have Constantinople after the Turks have been compelled to abandon its possession, which they have enjoyed for over 400 years, and have been compelled to retreat into Asia Minor.

Indeed, Sir Edward Grey practically said as much when, on February 25 last, he denied, in the House of Commons, that any agreement existed for a Muscovite occupation of Constantinople. He declared this in response to a question addressed to him as to whether Russia would be allowed to establish herself either temporarily or permanently on the shores of the Bosporus. But he added that Great Britain was wholly in sympathy with Russia's yearnings for free access from the Black Sea into the Mediterranean, and that these aspirations would receive their realization in the terms of peace bringing the present war to a conclusion.

A few days later the *Paris Temps*, which is the recognized organ of the French Minister and Department of Foreign Affairs, printed in that portion of its columns devoted to the most important official news a brief statement to the effect that France, Great Britain, and Russia had "reached an agreement regarding the future status of Constantinople and of the Dardanelles, giving to Russia entirely free passage at all times through the strait from the Black Sea to the Mediterranean."

According to private advices which reach me from Europe, the agreement reached by these three great powers with regard to the ultimate disposal of Constantinople and of the Dardanelles is one which has as yet received no mention in the press. It provides for the transfer of the city and of the straits under a European guarantee of neutrality, to King Albert of Belgium.—By "A VETERAN DIPLOMAT," *N. Y. Times*, 4/4.

ALBANIA AND THE DALMATIAN COAST.—Though nearly all Albanians on the coast, and many inland, speak Italian, which is the language of commerce in the Adriatic, Rome does not claim all Italian-speaking people as Italians. But she, too, since the recent Balkan wars, has been obsessed with the dread of Slav preponderance in the Near East. For her the freedom of the Adriatic is almost a question of life and death. Formerly, her enemy was Austria, who, holding Trieste, Pola, Sebenico, Cattaro, and the Dalmatian coast, possessed every harbor of importance on the eastern shores, save one, and was a constant menace to Italy. The great World War is altering this kind of unstable equilibrium in the Adriatic. There is every

chance that when the map of Europe is once again re-drawn, Bosnia and Herzegovina, with the Dalmatian littoral, will be in Slav hands, and the Austro-Hungarian empire replaced by a pushing and ambitious Southern Slav state with the greatly augmented force of Russia behind it. With the opposite coasts of the Adriatic from Trieste to Corfu in the hands of one strong power, Italy knows that she would be thrust down to the position of a dependency, and it is to avert that catastrophe that Admiral Patris was ordered in the last days of October to occupy the rocky and almost unknown island of Saseno, and on Christmas Day to land his Bersaglieri in the harbor of Valona. Almost more important than Dalmatia is the Albanian coast, for the Foundling State holds the eastern side of the narrow Straits of Otranto, which are less than 50 miles from shore to shore. Italy, therefore, has a very real and living interest in Albania, and she has almost ever since her *risorgimento* and consolidation worked with consuls, schools, posts, and shipping at the three principal towns of the coast, Scodra, Durazzo, and Valona, thereby taking up and carrying on the work of Rome and Venice.—WADHAM PEACOCK, *Contemporary Review*, March.

ITALY'S CLAIMS ON DALMATIA.—Against the incorporation of Trieste in the Kingdom of Italy, if Italy meanwhile has established her claim by belligerency, there will be no dissentient voice among the allied powers. But when it comes to the allotment of Dalmatia, I confess I forbode many and serious objections. I refrain from offering any opinion of my own on the Italian plea and the Russian demurrer, but it is worth while mentioning the two conflicting views.

Patriotic Italians like the Deputy Foscari hold that military considerations oblige Italy to possess herself of such strategical positions as are necessary to the efficacious defence of her territory; and the Dalmatian seaboard is one of these. This axiom underlay Italy's opposition to the annexation of Biserta by France, because it menaced Sicily, and to the occupation of the Epirus by Greece. But in comparison with the importance of Pola, Zara, Sebenico, and Cattaro to Italy, Biserta and the Epirus are but as dust in the balance. Dalmatia possesses not only great strategic, but also great defensive value. In the Adriatic Italy has no naval base worthy of the name. Venice lacks strategic importance, and Ancona is of little use either as a strategic or a defensive place. Indeed, it is more of a danger than a help, and for this reason it has lately been erased from the list of fortified ports. Brindisi is hardly more than a good naval station.

The arguments advanced by Signor Foscari and other Italian writers are thus derived exclusively from military and naval considerations. But there are others which appeal to Russia and Serbia of an order which has hitherto been in especial favor among Italians—the claims of nationalities. The Italians of Italia Irredenta number about 80 per cent of the entire population. In Dalmatia, on the other hand, the Italian element is estimated at no more than 2 per cent of the inhabitants, who, according to the census of 1910, number in all 634,885. The bulk of them is formed by 610,667 Serbo-Croatians, so that 97 per cent are Slavs. And of the 2 per cent many are said to be Slavised Italians, a supposition which is confirmed by their Serbo-Croatian names. To annex that country and population to Italy would, Russians contend, run diametrically counter to the principle of nationality with which Italy has heretofore identified her cause, and won for it the sympathies of the world.—E. J. DILLON, *Contemporary Review*, April.

ITALY AND RUMANIA

ROME, May 19.

Rumania's attitude regarding the war is being watched with keenest interest, as no official announcement has been made as to whether the cordial relations which always have existed between that country and Italy have been transformed into an actual alliance.

There undoubtedly is a diplomatic understanding between the two governments, as Prince Ghika, the Rumanian Minister, is the only foreign diplomat who has had long daily interviews with Foreign Minister Sonnino during the last fortnight.—*N. Y. Times*, 5/20.

THE BALKAN STATES

Opinion on the Balkan situation is agreed that the attitude of Bulgaria has thus far served to check any action on the part of Rumania or Greece, in spite of loans and other tangible inducements offered by the Allies to these states.

From an unsigned article in the *Quarterly Review* (April), in style and substance suggesting the authorship of the Hungarian historian Emil Reich, the following excerpts are taken:

That Austria meditated an attack on Servia so early as the preceding June (1913), when the war between the Balkan Allies, which she had deliberately fomented, broke out, seems proved by the recent revelations of M. Pichon and the historian Guglielmo Ferrero; while M. Take Jonescu, the Rumanian statesman, relates that at that time the Austrian minister at Bucarest declared to him that Austria would come to the aid of Bulgaria "with arms in her hands." "Nous avons fait bonne affaire," said a high Austrian official gleefully to a friend of the writer at the moment of the Bulgarian attack in Macedonia. But the Treaty of Bucarest caused Austria to make up her mind. The murder of the Archduke Francis Ferdinand, which took place ten months later, furnished a convenient pretext for putting her design into execution; Germany was now ready; the shining armor at Berlin was displayed to all the world, and the great catastrophe followed.

The Treaty of Bucarest is founded on the ruins of violated contracts; it stands on the flimsy substructure of torn-up "scraps of paper." It has not been recognized by any of the powers, and therefore cannot be regarded as a legitimate substitute for previous arrangements which they have drawn up or sanctioned. It presents a series of grotesque frontiers, traced on vindictive lines in violation of the principle of nationalities and in defiance of economic laws. Bulgaria now demands the revision of the treaty, so far, at least, as regards a portion of her lost kindred in Macedonia. On the reply to this request depends her attitude towards the present war, and, strangely enough, that of Rumania also; for Rumania, rightly desirous of union with the cognate race in Transylvania, is ready to throw in her lot with the Entente Powers if Bulgaria will do likewise. The question is thus of the utmost importance, for, apart from the considerable aid which the two states can render to the Allied cause, their military action would almost certainly be followed by that of Italy, and the war would be shortened by many months.

Bulgaria is willing to leave the whole question between herself and her former allies to the eventual decision of the powers, and to maintain a strict neutrality. In return for her neutrality she has been promised by the Entente Powers the whole of Eastern Thrace as far as the Enos-Midia line laid down by the Treaty of London, together with considerable concessions in Macedonia. This promise, it is understood, will be fulfilled at the end of the war. For her active and timely aid she has been promised larger concessions in Macedonia. But in return for this she desires the present cession of at least a portion of the district, now in Servian occupation, lying south of the line laid down by the Serbo-Bulgarian Treaty of 1912.

By the irony of fate Bulgaria, humiliated and despoiled, is now in a position to control the action of her neighbors; and the Entente Powers, anxious to secure her cooperation and that of Rumania, have undertaken to urge the desired concessions on Servia. M. Pashitch, if he were a free

agent, would doubtless comply; it is obviously in Servia's own interest to help her allies to shorten the war; and the concessions will in any case have to be made at its conclusion. But the military coterie which surrounds the Prince Regent will not hear of them. It was the officers who insisted on the repudiation of the treaty of 1912; among them are some of the conspirators who placed the present dynasty on the throne. Their calculation is that the Entente will win in the end and that no concessions will then be necessary; but they leave out of account the sacrifices which their policy will impose on their allies and on Servia herself owing to the protraction of the war.

In urging both Servia and Rumania to refuse all concessions to Bulgaria, Greece has acted against the interests of the Entente. Her policy is due in part to hostility to Bulgaria—the hatred of the Greek for the Bulgar is something phenomenal, surpassing in bitterness all other race-hatreds of the world; in part to the military considerations which dominate the court of Athens—Bulgaria, it is urged, must not receive any accession of territory, for her military strength would thereby be increased; in part to the fear that a precedent may be created for concessions on the part of Greece. Such concessions, however, will be inevitable if at the end of the war the Entente Powers carry out their declared intention to vindicate the principle of nationalities. Greece should seek her legitimate expansion in the twelve islands now occupied by Italy (that power obtaining compensation in the Trentino) and on the western coast of Asia Minor, where the Hellenic element is strong. Greece should withdraw from southern Albania in accordance with the Corfu Convention; and the Albanian State should be restored under a new ruler, receiving Ipek and Dibra in the north.

Nothing but an arrangement based on the sound principle of nationalities will ever bring peace to the Balkan Peninsula. A durable peace in southeastern Europe, followed by a revival of the Balkan Alliance, will, it is to be hoped, be among the beneficent results of the present calamitous war.

VALANDOVO INCIDENT.—A reported attack by Bulgarian irregulars on Servian frontier guards at the village of Valandovo, in Macedonia, was explained by Bulgaria as an uprising of Bulgarian inhabitants against Servian oppression. The *Paris Temps* made the following comment on Bulgaria's note to Servia:

It is with literal stupefaction we see the Bulgarian apology converted into a complaint of Serbian ill-treatment of Turkish subjects. The document takes its place among the least satisfactory ones of the war, rivaling those of Berlin, with whose chiefs it is difficult not to perceive Bulgarian complicity.

The frequency of the attacks on the Nish-Salonica Railway raises the matter above a mere incident. Let Bulgaria remember that hostility to Serbia means war with France, Great Britain, and Russia. The affair may be a plot of the Radoslavof Cabinet to prevent rumored changes. If so, it shows how greatly the changes are needed. If the present cabinet is incapable of wisdom let it resign or take the consequences.—*N. Y. Times*, 4/7.

NAVAL NOTES

Naval developments in the following strategic areas will be considered separately and in turn:

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1. NORTH AND BALTIC SEAS	1004
2. MEDITERRANEAN AND BLACK SEAS	1011
3. THE FAR EAST	1019
4. THE PACIFIC	1020
5. THE ATLANTIC	1020

BELLIGERENTS' WAR LOSSES

(On the left margin of this table of losses is a page reference to the Naval Institute War Notes.)

LOSSES OF BRITAIN AND HER ALLIES.

BRITISH WARSHIP LOSSES

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
245, 653, 1874..	Audacious	dreadnought	25,000..	By mine	27-10-14
247..	Bulwark	battleship	15,000..	Internal explosion	26-11-14
644..	Formidable	battleship	15,000..	Torpedoed	1- 1-15
658..	Irresistible	battleship	15,000..	By mine	18- 3-15
658..	Ocean	battleship	12,950..	By mine	18- 3-15
	Goliath	battleship	12,950..	By mine	
271, 1886..	Monmouth	armored cruiser	9,800..	By gun fire	1-11-14
271, 1886..	Good Hope	armored cruiser	14,100..	By gun fire	1-11-14
1863..	Aboukir	armored cruiser	12,000..	By Submarine U-9	22- 9-14
1863..	Hogue	armored cruiser	12,000..	By Submarine U-9	22- 9-14
1863..	Cressy	armored cruiser	12,000..	By Submarine U-9	22- 9-14
1583..	Warrior	protected cruiser	13,550..	By mine	
249..	Hermes	protected cruiser	5,600..	Torpedoed	31-10-14
	Gloucester	light cruiser	4,900..	By mine	
	Fearless	light cruiser	3,500..	By mine	
253..	Pathfinder	light cruiser	3,000..	By Submarine U-21	5- 9-14
	Arethusa	light cruiser	3,520..	By mine	
1583..	Pegasus	light cruiser	2,135..	By gun fire	20- 9-14
1567..	Amphion	scout cruiser	3,500..	By mine	6- 8-14
1867..	Hawke	unarmored cruiser	7,350..	By submarine U-9	15-10-14
	Druid	torpedoboat destroyer	770..	By mine	
	Laertes	destroyer	——..	By mine	
	Phoenix	destroyer	770..	By mine	
1004..	Maori	destroyed	1,035..	By mine	
1007..	Recruit	destroyer	385..		
1583..	Speedy	gunboat	810..	By mine	3- 9-14
247, 1873..	D-5	submarine	550..	By mine	3-11-14
1871..	E-3	submarine	725..	By mine	18-10-14
	A-E-1	submarine	725..	Foundered in Australia	14- 9-14
1018..	E-15	submarine	——..		
	D-2	submarine	600..		
	Fishguard II	training ship	——..	Foundered in North Sea	
250, 1873..	Niger	torpedo gunboat	810..	Sunk by submarine	11-11-14
	Mary	mine sweeper	——..	By mine	
	Name unknown.	mine sweeper	——..	By mine	
	Name unknown.	collier	——..	By mine	
1874..	Oceanic	troop ship	7,333..	Accidentally rammed	8- 9-14
	Rohilla	armed merchantman.	4,240..	By mine	30-10-14
649..	Viknor	armed merchantman.	2,960..	Wrecked	14- 1-15
	Bayano	auxiliary cruiser			
	Char	patrol tug	——..	Wrecked	16- 1-15

FRENCH WARSHIP LOSSES

658..	Bouvet	battleship	——..	By mine	18- 3-15
1012..	Leon Gambetta	armored cruiser	12,000..	By submarine	
656..	Dague	destroyer	720..	By mine	24- 2-15
666..	Mousquet	torpedoboat destroyer	298..	Gun fire by Emden	28-10-14
	No. 347	torpedoboat	98..	Sunk in collision	9-10-14
	No. 338	torpedoboat	97..	Sunk in collision	9-10-14
647..	No. 219	torpedoboat	——..		1-15
	Zelée	gunboat	680..	By gun fire	28-10-14
655..	Curie	submarine	398	Destroyed	-12-14
655..	Saphir	submarine	390..	Wrecked	17- 1-15

RUSSIAN WARSHIP LOSSES

267, 666..	Jemtchug	cruiser	3,050..	Torpedoed by Emden	28-10-14
	Pallada	cruiser	7,775..	By German submarine	11-10-14
	Putschino	torpedoboat		By gunfire	30-10-14
	Prut	armed merchantman.	5,500..	Gun fire	29-10-14
	Donetz	gunboat	1,200	By gunfire	29-10-14

JAPANESE WARSHIP LOSSES

1878..	Takachiho	old armored cruiser	3,700..	By mine	17-10-14
	Shirotaji	torpedoboat destroyer	380..	Wrecked	4- 9-14
	Name unknown.	torpedoboat	——..	By mine	
	33	torpedoboat	——..	By mine while dredging	11-11-14

LOSSES OF GERMANY AND HER ALLIES

GERMAN WARSHIP LOSSES

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
632	Blücher	armored cruiser	15,500	By gun fire	24- 1-15
276, 673	Gneisenau	armored cruiser	11,600	By gun fire	8-12-14
276, 673	Scharnhorst	armored cruiser	11,600	By gun fire	8-12-14
247	Yorck	armored cruiser	9,050	By mine	3-11-14
258	Friedrich Karl	armored cruiser	8,858	By mine in Baltic	-12-14
1566	Augsburg	protected cruiser	4,280	By gun fire	
1566	Magdeburg	protected cruiser	4,478	By gun fire	27- 8-14
1569, 1856	Mainz	protected cruiser	4,280	By gun fire	28- 8-14
1509, 1856	Koeln	protected cruiser	4,280	By gun fire	28- 8-14
1569, 1856	Ariadne	protected cruiser	2,660	By gun fire	28- 8-14
270, 670	Koenigsberg	protected cruiser	3,550	By gun fire	3-12-14
262, 666, 1880	Emden	third class cruiser	3,544	By gun fire	9-11-14
276, 673	Leipzig	light cruiser	3,250	By gun fire	8-12-14
276, 673	Nürnberg	light cruiser	3,450	By gun fire	8-12-14
	Dresden	light cruiser	3,544	By gun fire	14- 3-15
1871, 1861	Hela	small cruiser	2,040	By submarine	13- 9-14
	Kormoran	small cruiser	1,630	By gun fire, China	6-11-14
283	Geier	small cruiser	1,630	Interned	8-11-14
1584	Cap Trafalgar	auxiliary cruiser	9,854	By gun fire	14- 9-14
1578	Kaiser Wilhelm der Grosse	auxiliary cruiser	5,521	By gun fire	27- 8-14
	Prinz Eitel Friedrich	converted cruiser	8,865	Interned in Norfolk	
	Kronprinz Wilhelm	converted cruiser	14,705	Interned in Norfolk	
252	Berlin	converted cruiser	17,324	Interned in Norway	-11-14
	Patagonia	converted cruiser	———	Seized by Argentina—violation of neutrality	
	Eber	converted cruiser	1,000		
282	Cormorant	converted cruiser	6,000	Interned at Guam	
	V-186	destroyer	750	By gun fire	
1860	V-187	destroyer	650	By gun fire	28- 8-14
	S-106	destroyer	675	By gun fire	
1878	S-90	destroyer	400	Ran ashore and destroyed	20-10-14
1869	S-115	destroyer	420	By gun fire	17-10-14
1869	S-117	destroyer	420	By gun fire	17-10-14
1869	S-118	destroyer	420	By gun fire	17-10-14
1869	S-119	destroyer	420	By gun fire	17-10-14
1861	S-126	destroyer	487	Torpedoed	6-10-14
250	S-124	destroyer	350	Accidentally rammed by Danish steamer	23-11-14
	Taku	destroyer	———	Sunk	6-11-14
270	Iltis	river gunboat	900	By gun fire, China	6-11-14
270	Luchs	river gunboat	900	By gun fire, China	6-11-14
270	Tiger	river gunboat	900	By gun fire, China	6-11-14
270	Jaguar	river gunboat	900	By gun fire, China	6-11-14
250	U-18	submarine	750	Rammed by patrol boat	23-11-14
648	Name unknown	submarine	———	By gun fire	
648	Name unknown	submarine	———	Rammed	24-10-14
648	U-15	submarine	250	Rammed	9- 8-14
1009	U-29	submarine	800	Lost	
	Name unknown	minelayer	———	Captured by French	
1566	Koenigin Luise	minelayer	948	By gun fire	5- 8-14
	Markomannia	supply ship for Emden	2,840	Captured	-10-14
	One supply ship.	———	———	By gun fire	
	One supply ship.	———	———	Captured	
	Name unknown	2 colliers of Admiral von Spee	———	Captured	
	Exford	collier to Emden	———	Captured	
	Moewe	survey ship	650	By gun fire	9- 8-14
1885	Komet	old destroyer	———	Captured	
	Planet	survey ship	650	By gun fire	
	Locksun	naval tender	———	Interned	8-11-14
	Karnac	auxiliary transport	———	Interned in Chile	-11-14

AUSTRIAN WARSHIP LOSSES

270	Kais'n Elizabeth	protected cruiser	4,000	Sunk	6-11-14
	Beethoven	converted cruiser for training	———	By mine	
1574	Zenta	light cruiser	2,300	By gun fire from French ship	16- 8-14
No. 19	Name unknown	torpedoboat	———	Sunk by mine	17- 8-14
	Name unknown	torpedoboat	———	Sunk by mine in Adriatic	
	Name unknown	torpedoboat	———	Sunk by mine in Adriatic	
	Name unknown	submarine	———	By gun fire from French cruiser	
	Temes	gunboat	440	Mined	23-10-14

TURKISH WARSHIP LOSSES

PAGE	NAME	CLASS	TONNAGE	HOW LOST	DATE
260	Messudiyeh	battleship	10,000	Sunk by British submarine	13-14
	Three transports with troops		——	Sunk by Russian warships	
	Name unknown	gunboat	——	By mine near Dardanelles	
1019	Dhair Hissar	torpedoboat	97	Destroyed	

GERMAN SHIPS AT LARGE

BATTLE CRUISER

	Tonnage	Built	Men
Goeben	22,600	1911	...

UNARMORED CRUISERS

Karlsruhe (unofficially reported wrecked)	4,850	1913	373
Breslau	4,500	1911	165

The *Breslau* and *Goeben*, although nominally sold to Turkey, are regarded by the Allies as German to all intents.

NORTH AND BALTIC SEAS

BRITISH SHIPS IN HOME WATERS

12 super-dreadnought battleships.
(3 were due for completion this year and are probably now in commission.)
11 dreadnought battleships.
7 dreadnought battle cruisers.
37 pre-dreadnought battleships.
27 armored cruisers.
22 light cruisers.
41 protected cruisers.
198 destroyers.
89 torpedo-boats.
70 submarines.
7 mine layers.
3 repair ships.

GERMAN SHIPS IN HOME WATERS

16 dreadnoughts.
4 battle cruisers.
24 pre-dreadnoughts.
9 armored cruisers.
30 light cruisers.
151 destroyers.
43 torpedo-boats.
38 submarines.

RUSSIAN SHIPS IN BALTIC WATERS

4 pre-dreadnought battleships.
13 armored and protected cruisers.
2 light cruisers.
80 destroyers.
24 submarines.

GERMAN MINE SINKS A BRITISH DESTROYER

LONDON, May 8.

The following official communication was issued this evening:

While operating off the Belgian coast the torpedo-boat destroyer *Maori*, Commander B. W. Barrow, Royal Navy, struck a mine about two miles northwest of the Weilingen Lightship.

BERLIN (via London), May 8.

An official communication by the German War Office announces the sinking of the British destroyer *Maori* in these words:

The British destroyer *Maori* was sunk off Zeebrugge. The destroyer *Crusader*, which had come to its support, was forced to retreat and leave in the lurch lifeboats which it had launched.

The entire crew of the *Maori* and the boats' crews of the *Crusader* were saved by our own vessels and taken into Zeebrugge. In all there were seven officers and 88 men.

The *Maori* was 280 feet long and of 1035 tons displacement. She was built in 1909, and her complement was 71 men. She was armed with two 4-inch guns and two torpedo tubes.—*N. Y. Times*, 5/9.

AUXILIARY CRUISER "BAYANO" SUNK.—The Secretary of the Admiralty announced on Friday last the loss of His Majesty's auxiliary cruiser *Bayano* while engaged in patrol duty.

On the 11th inst. the wreckage of the vessel and bodies were discovered, and circumstances point to her having been sunk by an enemy's torpedo.—*United Service Gazette*, 3/18.

THE HELIGOLAND BATTLE.—The German Rear Admiral Kalau vom Hofe has already produced a book on "The German Navy in the World War of 1914-15." It contains a long account of the Heligoland engagement of August 28, concluding as follows:

"The scheme for this undertaking can be described as a model for the joint tactical employment of various types of ship, and it does all honor to the then First Sea Lord, Prince Louis of Battenberg. The weather was extraordinarily favorable as regarded the attack upon the German outposts. The result of the attack upon the German destroyers undertaken by two cruisers and 31 destroyers was the destruction of *V 187*—truly no great success. Just as little can the sinking of our three small cruisers be claimed as a brilliant achievement for the dreadnought cruisers which came up under shelter of the fog. The English did not achieve their main object, which was to damp the German spirit of offensive."—*N. Y. Times*, 3/8.

STORY OF OPERATIONS OFF BELGIAN COAST

ADMIRALTY, April 12, 1915.

The following despatch has been received from Rear Admiral the Hon. Horace L. A. Hood, C. B., M. V. O., D. S.O., reporting the proceedings of the flotilla off the coast of Belgium between October 17 and November 9, 1914:

November 11, 1914.

Sir.—I have the honor to report the proceedings of the flotilla acting off the coast of Belgium between October 17 and November 9. The flotilla was organized to prevent the movement of large bodies of German troops along the coast roads from Ostend to Nieuport, to support the left flank of the Belgian Army, and to prevent any movement by sea of the enemy's troops.

Operations commenced during the night of October 17, when the *Attentive*, flying my flag, accompanied by the monitors *Severn*, *Humber*, and *Mersey*, the light cruiser *Foresight*, and several torpedo-boat destroyers, arrived and anchored off Nieuport Pier. Early on the morning of October 18 information was received that German infantry were advancing on Westende village, and that a battery was in action at Westende Bains. The flotilla at once proceeded up past Westende and Middlekirke to draw the fire and endeavor to silence the guns. A brisk shrapnel fire was opened from the shore, which was immediately replied to, and this commenced the naval operations on the coast, which continued for more than three weeks without intermission. During the first week the enemy's troops were endeavoring to push forward along the coast roads, and a large accumulation of transport existed within reach of the naval guns.

On October 18 machine guns from the *Severn* were landed at Nieuport to assist in the defence, and Lieutenant E. S. Wise fell gallantly leading his men. The *Amazon*, flying my flag, was badly holed on the water-line, and was sent to England for repairs, and during these early days most of the vessels suffered casualties, chiefly from shrapnel shell from the field guns of the enemy.

The presence of the ships on the coast soon caused alterations in the enemy's plans. Less and less of their troops were seen, while more and more heavy guns were gradually mounted among the sand dunes that fringe the coast. It soon became evident that more and heavier guns were required in the flotilla. The scouts therefore returned to England, while H. M. S. *Venerable* and several older cruisers, sloops, and gunboats arrived to carry on the operations.

Five French torpedo-boat destroyers were placed under my orders by Admiral Favereau, and on October 30 I had the honor of hoisting my flag in the *Intrepid*, and leading the French flotilla into action off Lombartzyde. The greatest harmony and enthusiasm existed between the Allied flotillas.

As the heavier guns of the enemy came into play it was inevitable that the casualties of the flotilla increased, the most important being the disablement of the 6-inch turret and several shots on the water-line of the *Mersey;* the death of the commanding officer and eight men and the disablement of 16 others in the *Falcon*, which vessel came under a heavy fire when guarding the *Venerable* against submarine attack. The *Wildfire* and *Vestal* were badly holed, and a number of casualties caused in the *Brilliant* and *Rinaldo*. Enemy submarines were seen and torpedoes were fired, and during the latter part of the operations the work of the torpedo craft was chiefly confined to the protection of the large ships.

It gradually became apparent that the rush of the enemy along the coast had been checked, that the operations were developing into a trench warfare, and the work of the flotilla had for the moment ceased. The arrival of Allied reinforcements and the inundation of the country surrounding Nieuport rendered the further presence of the ships unnecessary.—*Naval and Military Record*, 4/14.

THE CUSHING'S CAPTAIN TELLS OF ATTACK BY GERMAN AVIATOR

PHILADELPHIA, PA., Wednesday.

Captain Lars Larsen Herland, of the American steamship *Cushing*, arrived here to-day with his ship and submitted to his employer a report dealing with the attack made on the *Cushing* on April 28 by a German aeroplane, which dropped three bombs, one of which struck the rail of the vessel.

The German airmen swept in narrow circles over the vessel, trying to get directly over the funnel, with the idea, apparently, of dropping a bomb down it and wrecking her engine room.

The crew, at first crowding on deck, quickly retreated to the forecastle, and no one was hurt by the explosion of the bomb which did strike the *Cushing*.

The attack occurred while the *Cushing* was about 25 miles from Antwerp and 8 miles from the North Hinder lightship. It was near 7 o'clock in the evening, but the sun had barely touched the horizon, and there was ample light for the officers and crew to see every detail of the attack, and also for the pilot of the biplane to see the words, "*Cushing*, New York, United States of America," painted on each side of the vessel in letters 8 feet high, and to note the Stars and Stripes at the masthead and the taffrail.

On her return journey from Antwerp to this port the *Cushing* grazed a floating mine in the North Sea, off the English port of Deal. Clever seamanship by the first mate, Charles Christopher, who was at the wheel, enabled the *Cushing* to avoid this mine, but by such a narrow margin that, though the stern of the vessel touched the mine, it struck so gently that no explosion followed.

When the aeroplane was first noted by the lookout it was several thousand feet in the air and was coming apparently from the coast of England.

The aeroplane began to drop down as it approached the ship and soon was only about 500 feet in the air. Everybody watched with interest the skillful way in which the lone pilot of the biplane handled his machine. An attack was not even considered a possibility, for up to that time all thought the machine an English craft.

Suddenly the biplane swooped down until it was only 300 or 400 feet above the *Cushing*. A second later there was a tremendous explosion and a solid wave of water flooded the stern deck. The crew fled for the nearest hatchways, and dived down just as a second bomb fell, missed the port

quarter by a foot or so, and dropped into the sea. Another explosion sent another wave cascading over the lower deck.

The biplane swung up into the wind, hung motionless for a second or so, then came the third bomb, which just grazed the starboard rail and shot into the sea.

The aeroplane hung for a few minutes, then headed for the Dutch coast.

When the machine dropped down so close to the ship it was seen she was flying a white flag with a black cross in the center, the admitted pennant of the German air fleet. This fact, together with the circumstance that the biplane made off in the direction of the Dutch coast after the bombardment, is regarded as convincing evidence that it was a German craft.—*N. Y. Herald*, 5/20.

LOSS OF DESTROYER "RECRUIT."—The Secretary of the Admiralty makes the following announcement:

A series of small affairs took place in the neighborhood of the Galloper and North Hinder lightships on Saturday.

During the forenoon H. M. destroyer *Recruit* was sunk by a submarine, four officers and 21 men being saved by the trawler *Daisy*.

At 3 p. m. the trawler *Colombia* was attacked by two German torpedo-boats who approached her from the westward and commenced the action without hoisting their colors.

The *Colombia* was sunk by a torpedo, only one deck-hand being saved by other trawlers.

A division of British destroyers, comprising *Laforey, Leonidas, Lawford,* and *Lark,* chased the two German vessels, and after a brief running fight of about one hour, sunk them both.

The British destroyers sustained no casualties.

Two German officers and 44 men were rescued from the sea and made prisoners of war.

The *Recruit* was a torpedo-boat destroyer of 385 tons, belonging to the C class, build at Clydebank in 1896, and armed with one 12-pounder and five 6-pounder guns. She had also two 18-in. torpedo tubes. Her speed was 30 knots, and her complement was 60. The *Laforey, Leonidas, Lawford* and *Lark* are sister ships, built in 1913. Each is of 965 tons displacement, and armed with three 4-in. guns and four 21-in. torpedo tubes. They have a speed of 35 knots.—*London Times*, 5/3.

TORPEDO-BOATS AT ANTWERP

ROTTERDAM, May 16.

(Dispatch to the *London Daily News.*)—A new torpedo-boat was launched at Holbolsen shipyard at Antwerp on Wednesday and towed through Ghent.

There are now at Holbolsen two more torpedo-boats completed, also two small gunboats intended for operations from Zeebrugge.—*N. Y. Times*, 5/17.

GERMANS SHELL DUNKIRK.—It has now been established that the shells have come from two directions, and it is conjectured that the enemy has placed powerful howitzers in position at a point near Dixmude. That they have been placed there for the express purpose of destroying Dunkirk there can be no question, and until they are silenced Dunkirk will be exposed to a long-distance shell fire, to which for the present there are no effective means of replying.

The Track of the Shells.—Pieces of the shells which exploded in the town have been collected and carefully examined with a view to ascertaining the caliber of the weapons from which they were fired. The general opinion seems to be that they are 38-centimeter howitzers. Some of the shells bear the name of Krupp; others, the name of the Austrian Skoda Works.

There are some who hold that they were fired from the powerful howitzers of Austrian design which reduced the forts of Liége, Antwerp, Maubeage, and Namur. These big howitzers can project a huge shell more than 20 miles; but to get the full range out of them they have to be mounted on a solid concrete bed, to which they are firmly bolted.

The great shells burst with terrifying and devastating effect. The noise resembled the explosion of a powder factory, and they shot into the air a huge column of black smoke, earth, and *débris*. On Thursday and yesterday wide and deep craters were ploughed in the roads where they fell, several large buildings were wrecked in the center of the town, and small houses on the outskirts were completely destroyed.

A Possible Menace to Dover.—Such are some of the effects of these great shells, fired from a distance of more than 20 miles. The damage that these long-range howitzers can do is worth pondering by people at home.

If the enemy had won his way to the northern coast of France, these engines of war would have been mounted on the cliffs of Calais. Their huge projectiles would have come crashing into Dover; the enemy would have been master of the Straits. That is a danger which even yet menaces England.—*London Times*, 5/3.

LONG RANGE BOMBARDMENT.—The astonishment which was aroused by the fact that the Germans were able to bombard Dunkirk from a distance of over 20 miles was confined entirely to the lay public; for military men, and particularly artillerists, have long known that it was possible to throw shells to a distance of 20 and even 30 miles if it was considered desirable to do so. It is probable that neither the German 16¼-inch, nor the Austrian 12-inch gun was used, for neither of these pieces can cover any such range. More than likely a 12-inch naval piece of the older, short-caliber pattern was used and fired at a high angle of elevation.

ALLEGED GERMAN ACTIVITY.—An official telegram from Berlin on April 23 said: "The Admiralty Staff states that recently the German High Sea Fleet has repeatedly been cruising in the North Sea, and has advanced into English waters without meeting any British naval forces." This *communiqué* afforded the text for a number of articles in the German Press on the doings of their fleet. According to Monday's wireless from Berlin the papers called attention to the fact that the German battle fleet had patrolled the entire North Sea without meeting the English fleet, which is "hiding somewhere on the North Coast of Scotland or in the Irish Sea." The naval expert of the *Deutsche Tageszeitung*, Count Reventlow, accentuates that for the first time the German Admiralty has announced that the entire German fleet is busily engaged searching the North Sea for the English fleet, whereas before only squadrons have been sent out. Further proof of the abdication of the North Sea by the British, concludes the wireless news, is the fact that a German submarine has been able to escort a captured British steamer from Aberdeen across the North Sea to Cuxhaven. According to the Berlin evening papers on April 22, this captured steamer is the *Glen Corse*, which is not exactly a steamer but a steam trawler. She was stopped by a submarine off the Scottish coast—there is only the German word for it that it was near Aberdeen—and brought to the German port.—*Army and Navy Gazette*, 5/1.

NORTH SEA LIVELINESS.—Besides the Germans neutrals have also reported signs of activity recently on the part of the Kaiser's Navy. The Norwegian steamer *Solvin* reports having seen off Heligoland a German squadron of 100 large and small warships. A Copenhagen message on April 22 said that the Swedish steamship *Uranus*, on which a Zeppelin tried to drop bombs, reported that she met a whole German squadron in the North Sea, and one German warship came quite close, but having seen the Swedish colors, it left. Reports from Christiania state that German submarines have

been seen near Hviddingensoe. It is believed that the cannonade recently heard was from a British cruiser which was chasing these submarines. A German torpedo flotilla has turned away about fifty Danish fishing vessels from fishing places at Hornsrev, and a telegram on April 26 from Esbjerg says that the German officers have forbidden the fishing vessels to return to Hornsrev, fearing that the British Navy will use them for hiding purposes. The Danish steamer *Slesvig*, of Copenhagen, returning from England with coal and bound for Norrkoeping, Sweden, was held up on April 26 by a German torpedo destroyer off Falsterbo, Sweden. The commander of the destroyer ordered the *Slesvig* to go to Swinemünde, but after some negotiation allowed her to proceed to Koege, Denmark, to discharge, but not to Sweden. A skipper who arrived at Esbjerg on Monday morning reports that in the course of the previous two days he had seen one Zeppelin, two submarines, and thirty torpedo-boats in the North Sea. The Germans are reported to be very anxious to warn all fishing boats not to go near the German coast, evidently fearing that these vessels may hide the approach of British ships. The *Vossische Zeitung* says the Norwegian steamer *Foldin* met the German fleet last Sunday off Heligoland. The German commander said to the captain that the German fleet had one desire only, and that was to engage the British fleet, and he hoped that the British fleet might be found. A Copenhagen message on Saturday said that the *Politiken* stated that the S. S. *Salvin* (?) had arrived at Christiania from England. She reported that last Sunday, to the west of Heligoland, she met a large number of German warships. She was stopped but was given permission to proceed.—*Army and Navy Gazette*, 5/1.

HOLLAND TRAFFIC STOPPED.—On April 22 the following official British statement was issued at Amsterdam:—"All shipping and passenger traffic between Holland and the United Kingdom is stopped for the time being. No ships will leave the United Kingdom for Holland after to-day. Ships from Holland will not be admitted to the United Kingdom after to-day. It is hoped shortly to resume a limited cargo and passenger traffic. Special arrangements are being made for the transport of the mail." Instructions were on the same day issued by the customs authorities at Hull that sailings to Holland must be stopped. The prohibition affects mainly one firm, who have six steamers maintaining a service between Hull and Harlingen, Amsterdam and Rotterdam. On April 22 also the Dutch Postmaster-General announced that the mail service between Holland and England was suspended until further notice. The *Frankfurter Zeitung* regards the measure as meaning "that England is either about to take strong reinforcements to the front, or is planning some other important action."—*Army and Navy Gazette*, 5/1.

"U 29" SUNK.—The German Admiralty has given out an official statement in which the loss of the submarine *U 29* is accepted, and this confirms the report of the British Admiralty of March 26, that it had reason to believe that *U 29* had been sent to the bottom. The text of the official German communication is as follows: "The submarine *U 29* has not returned from its last cruise. According to a report of the British Admiralty of March 26, this vessel with her crew was sent to the bottom. She therefore must be regarded as lost." The *U 29* was generally believed to have been commanded by Captain Otto Weddigen, who had charge of the *U 9* when this submersible sank the *Hogue*, the *Aboukir* and the *Cressy* last September. Captain Williams, of the British steamship *Andalusian*, which was among three steamers destroyed by the *U 29* early in March, was taken on board the German submarine. The face of the captain was familiar, and he asked him if he was Captain Weddigen. This the captain admitted. Referring to his new command, the *U 29*, he said it was the last word in German submarine construction. She displaced 800 tons and could make 18 knots on the surface and 10 knots submerged. When she sank the three

merchant vessels all the same day, the submarine towed the boat crews, 95 in all, to a reasonable safety zone, and surviviors spoke very highly of this captain as a considerate man.—*Army and Navy Gazette*, 4/17.

REPORTED SUBMARINE LOSS.—A Berlin official telegram on April 22 said that the Admiralty Staff reported that "British submarines have recently been repeatedly observed in the Heligoland Bight. They were attacked by German forces, and a hostile submarine was sunk on the 17th inst. It is probable that other submarines have been destroyed, but this cannot be ascertained with certainty." No confirmation of this reported loss has been made by the British Admiralty.—*Army and Navy Gazette*, 5/1.

GERMAN AIRMAN SINKS BRITISH SUBMARINE

BERLIN, May 4 (via London).

The following official communication was issued to-night:

"On May 3 a German naval airship had an engagement with several British submarines in the North Sea. Several bombs were dropped from the airship, one of them hitting and sinking one of the submarines.

"The airship was bombarded by the guns of the submarines without being hit. It returned safely."—*N. Y. Times*, 5/5.

HOSPITAL SHIP "EXPLANATION."—The German Embassy at Washington on Sunday published an admission of the attack on the hospital ship *Asturias* off Havre, evidently received in a cablegram from Berlin. It runs as follows:

The government is sorry to admit that the *Asturias* was attacked on February 1 at 5 p. m. Looming up in the twilight, carrying the lights prescribed for ordinary steamers, the *Asturias* was taken for a transport carrying troops. The distinctive marks showing the character of the ship not being illuminated, they were only recognized after a shot had been fired. Fortunately the torpedo failed to explode, and the moment the ship was recognized as a hospital ship every attempt at further attack was immediately given up.—*Army and Navy Gazette*, 3/13.

GERMANS NEARING RIGA.—Whatever may be its importance from a strategical point of view, the German invasion of the Russian Baltic provinces has progressed with remarkable rapidity. The Germans claim to have beaten the Russians at Shavli, and, in pursuing them northwards, their advance guards are said to have reached the region southwest of Mitawa, which is within 30 miles of Riga and over 110 miles from the East Prussian frontier.—*London Times*, 5/3.

GERMANS CAPTURE LIBAU

BERLIN (via London), May 8.

Official announcement was made at the War Office to-day that the city of Libau, in the Province of Courland, Russia, has been captured by the Germans.—*Boston Evening Transcript*, 5/8.

The Petrograd despatches betray considerable uneasiness at the loss of the seaport of Libau thirty-five miles from the East Prussian frontier. Libau was taken by a combined attack of a German army and part of the German Baltic fleet; and it will now afford a first-rate base for naval operations against Riga and other ports to the north. It may also be used by the Germans as a base for a land attack on the flank of the Russian army resting on the line of the Niemen River, with the Warsaw-Petrograd Railway as an objective beyond. Finally, if the Germans can gain control of the triangular wedge of territory north and east of Libau between that port and the Gulf of Riga, they will have a very fertile agricultural region upon which to draw in eking out their food supply.—*Outlook*, 5/19.

THE THREAT ON THE RUSSIAN RIGHT

The Germans have reached Shavli, half way along the main road from Tilsit through Tauroggen, to Riga. The distance from Tilsit to Riga is about 150 miles. If the Germans establish themselves at Shavli, Libau

will be cut off from Kovno, and the Riga traffic will have to be diverted from Mitau and Muravjevo to Dunaburg and Vilna. The Russians, of course, hold Kovno, Vilna, and Dunaburg in strong force.—*London Times* 5/3.

MEDITERRANEAN AND BLACK SEAS

The naval powers are represented in the Mediterranean as follows:

FRANCE

4 dreadnoughts.
18 pre-dreadnoughts.
(All carry 12-inch guns.)
20 armored and protected cruisers.
11 light cruisers.
(Several of these were abroad at the opening of the war.)
84 destroyers.
153 torpedo-boats.
(Most of these are small and probably suitable only for harbor defence work.)
70 submarines.

GREAT BRITAIN

3 battle cruisers.
4 armored cruisers.
16 destroyers and depot ships.
2 gunboats.
6 submarines.
(3 at Malta; 3 at Gibraltar.)
16 torpedo-boats.

AUSTRIA-HUNGARY

3 dreadnoughts.
(Only the dreadnoughts and 3 of the pre-dreadnoughts are armed with 12-inch guns. The others carry 9.4-inch weapons.)
12 pre-dreadnoughts.
2 armored cruisers.
12 light cruisers.
(Including 3 nearing completion at the outbreak of the war.)
19 destroyers.
11 submarines.
58 torpedo-boats.
(These torpedo-boats are only 200 tons or smaller; armed for the most part with 3-pounders.)

FRENCH CRUISER LÉON GAMBETTA TORPEDOED

PARIS, April 28.

The following *communiqué* is issued by the Ministry of Marine:

"The armored cruiser *Léon Gambetta,* while cruising at the entrance to the Otranto Straits, was torpedoed on the night of April 26-27, and sank in ten minutes. All the officers perished at their posts.

"One hundred and thirty-six of the crew, 11 of whom were petty officers, were saved by ships sent to the rescue by the Italian authorities."

AMSTERDAM, April 28.

A telegram from Vienna says that the Navy Department announces that the submarine *No. 5,* commanded by Lieutenant Georg Ritter von Trapp, torpedoed and sank the French cruiser *Léon Gambetta* in the Ionian Sea.—*Reuter.*

ROME, April 28.

The *Léon Gambetta* was torpedoed 20 miles off the Italian coast. At the time of the disaster the ship was traveling at not more than seven knots, and was on her way to Malta to rendezvous with other cruisers. The first torpedo struck her at 1 a. m., and was followed almost immediately by a second, which exploded abreast of the engine-room. The dynamos were wrecked, with the result that the ship was not only plunged in complete darkness, but her wireless installation was also paralyzed. The vessel was, therefore, unable to call for help.

As a last desperate measure her bows were headed for the shore in the hope that she might be beached. This, however, proved impossible, as the cruiser was making water rapidly. Ten minutes after the *Léon Gambetta* had been struck she sank. Two of the boats which had been lowered, capsized, drowning all on board. The head of the signal station at Santa Maria di Leuca made a gallant attempt to rescue the crew. A patrolling flotilla attached to the station was cruising near the scene of the disaster, and without considering the danger of being mistaken for French ships in the night by Austrian vessels, the Italian boats rushed to the help of the *Léon Gambetta,* which was drifting before a strong sirocco. The Italian torpedo-boats *Nos. 33* and *37* were the first on the scene, and found blue-jackets swimming about, clinging to pieces of wreckage and overturned boats, while others were on rafts which had been constructed with oars and planks. Twenty-eight were picked up by the torpedo-boats. A little later a flotilla of destroyers and tugs arrived from Taranto and rescued 108 survivors, who were conveyed to Castrignano del Capo Lecce and Taranto.

Rear Admiral Sénès, who flew his flag on the ill-fated vessel, and all the officers of the cruiser gallantly went down with their ship.—*Reuter.*

The *Léon Gambetta* was a fine armored cruiser of over 12,000 tons displacement, and, although not one of the latest type, was a useful, well-armed and protected vessel. She was launched at Brest in 1901, and carried

as her heaviest weapons four 7.6-in. caliber guns. Her crew numbered 725 souls.

It will be noticed that the cruiser is reported in the official *communiqué* to have been torpedoed during the night whilst cruising at the entrance to the Straits of Otranto. This appears to have been only the second time on which a submarine has been able to torpedo a vessel after dark, or, at least, after nightfall. The other instance is that of our own *Formidable*. It is certain that in such circumstances the submarine must be running on the surface, and that she makes her attack as a destroyer would, and not by the use of the periscope. There are not many submarines in the Austrian navy, nor are those they possess of the largest type. In an Italian telegram, and it was in Italy that the survivors were landed, the number of the boat is given as *U 5*, and this is confirmed by the Austrian *communiqué*. That boat has a surface displacement of about 230 tons, and such a boat might approach a cruiser on a moonlight night within torpedo range without great chance of being observed.—*London Times*, 4/29.

GERMAN VERSION OF CHASE OF "GOEBEN"

VENICE, March 30.

The *Arbeiter Zeitung* of Vienna yesterday published an interesting letter sent to his relative by a warrant officer of the *Goeben*, in which the writer gives an account of the experiences of the *Goeben* and the *Breslau* since the beginning of the war. The officer, writing from on board the *Goeben* at Constantinople, says:

On August 2 the news reached us in Messina of the declaration of war against Russia, and on the same night we sailed, in company with the *Breslau*, with all lights out, from Messina for Philippeville. On the following night we cut our way through the French patrol between Bizerta and Toulon, and at six o'clock on August 4 we were off Philippeville. The *Breslau* had already parted company with us during the night with the intention of bombarding Bona. We sailed into the harbor, hoisted the German flag, and opened the bombardment. The harbor was destroyed. The two forts returned our fire with guns of heavy caliber, and we withdrew at full speed, followed by a storm of shells. A little later we were joined by the *Breslau*.

At 30 Knots.—We had not been in company very long when we sighted a squadron of warships. We cleared for action and steamed towards them, but the vessels turned out to be British, and Great Britain had not yet declared war. They steamed past us, swung round, and closed up behind. They were the armored cruisers *Indefatigable* and *Inflexible* and the light cruisers *Gloucester* and *Weymouth*. We asked them what they wanted, and received the reply: "War is threatening between Great Britain and Germany." And now our business was to clear out as their superiority was altogether too much for us. After a superhuman effort we succeeded. For 24 hours everybody on board, including officers and warrant officers, took his turn at stoking or coal-trimming. In the afternoon we had worked up to a speed of 30 knots, and I thought every moment that the ship would blow up. The *Goeben* shook and trembled as she went through the water, but by the evening the British were out of sight.

The same night we learnt by wireless of Great Britain's declaration of war. Half an hour later, standing stripped and black as niggers at our guns, we beat off an attack by six torpedo-boats. We reached Messina utterly worn out, but as we knew that we should have to leave the harbor within 24 hours, there was no time for rest. We had to take in all the coal we could. Meanwhile, a French squadron assembled outside territorial waters to cut us off. While we were coaling we received a telegram from the Emperor, which said: "I am firmly convinced that the *Goeben* and the *Breslau* will fight their way through." And we did fight our way through. We threw all we could overboard, and steamed out of the harbor at six o'clock, trusting in God.

British Ships "Damaged."—Thirteen large ships and 10 destroyers were waiting for us outside. Ours was a life-and-death run, and that can be vouched for by the French and British cruisers which took refuge in Port Said and Alexandria, heavily damaged and no longer capable of fighting. They knew how German seamen can shoot. On Sunday, August 9, we reached one of the numerous little Greek islands. It was impossible for us to leave the Mediterranean, and our communications with the Austrians in the Adriatic were interrupted by the British and French fleets. There was nothing left for us to do but to take up the struggle against overwhelming odds. And then our deliverance came to us. We were lost to Germany, but Turkey bought the *Goeben* and the *Breslau,* and at five o'clock on August 10 we ran into the Dardanelles. Two hours later five large British ships and seven torpedo-boats were outside the Dardanelles and demanded that they should be allowed to enter the straits and that we should be given up to them. Both demands were refused by Turkey. We breathed more easily, for we were so exhausted that we would not have been able to hold out another week. We were given a fortnight's rest, and the British admiral commanding the Mediterranean squadron was called home and tried by court-martial because he had allowed the *Goeben* and the *Breslau* to escape. —*Press Association War Special, Naval and Military Record,* 4/7.

"GOEBEN" OUT AGAIN

PETROGRAD, Monday.

An official report issued here to-day states:

On the 3d inst. (April), in the Black Sea, near the Crimean Coast, our fleet exchanged shots at long range with the cruisers *Goeben* and *Breslau,* and pursued them until dusk.

During the night our torpedo-boats encountered the cruisers 100 miles from the Bosporus, but the enemy opened a vigorous fire and avoided an engagement.—*Press Association War Special, Naval and Military Record,* 4/7.

THE RUSSIAN BLACK SEA FLEET

Warships	Tonnage	Horsepower	Guns	Torpedo Tubes
10 battleships	150,522	153,215	336	29
2 cruisers	13,350	39,000	60	4
22 destroyers	15,500	297,500	58	48
14 torpedo-boats	2,082	30,080	30	32
2 torpedo-boat transports	6,839	4,137	20	..
11 submarines	4,873	13,590	7	30
4 gunboats	5,059	5,937	11	..
7 transports	28,046	14,872	..	..
1 despatch boat	400	3,300	6	2
2 yachts	3,820	7,780	16	..
12 port vessels	13,373	7,808	22	5
87 warships	243,864	577,219	566	150

THE TURKISH FLEET

1 battle cruiser	22,640	70,000	34	4
3 battleships	29,320	31,400	94	6
1 coast defence ship	2,400	2,200	22	..
2 protected cruisers	8,220	34,300	28	4
2 torpedo gunboats	1,540	10,200	24	6
9 destroyers	3,930	4,500	56	20
15 torpedo-boats	1,990	30,000	18	8
33 warships	70,040	182,600	276	48

—*N. Y. Herald,* 3/6.

The total force bombarding Dardanelles as now revealed is as follows:

BRITISH SHIPS

Name	Guns	Weight of broadside: Heavy guns	Weight of broadside: Secondary guns
Queen Elizabeth	Eight 15-inch, twelve 6-inch	15,600 lb.	600 lb.
Inflexible	Eight 12-inch, sixteen 4-inch	6,800 lb.	372 lb.
Agamemnon	Four 12-inch, ten 9.2-inch	5,300 lb.	———
Queen	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Implacable	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Cornwallis	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Vengeance	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Albion	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Lord Nelson	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.
Triumph	Four 10-inch, fourteen 7.5-inch	3,312 lb.	———
Majestic	Four 12-inch, twelve 6-inch	3,400 lb.	600 lb.

FRENCH SHIPS

Suffren	Four 12-inch, ten 6.4-inch	3,880 lb.	495 lb.
Charlemagne	Four 12-inch, ten 5.5-inch	3,880 lb.	330 lb.
Gaulois	Four 12-inch, ten 5.5-inch	3,880 lb.	330 lb.
	Two 12-inch, two 10.8-inch, eight 5.5-inch	2,416 lb.	264 lb.

SECOND PHASE.—On April 25, or nine weeks after the Allied fleet opened the bombardment on the forts at the entrance to the Straits, the second phase of the operations at the Dardanelles was entered upon. It had previously been revealed, of course, that the undertaking would be of a conjoint character. As far back as March 12, an official French note stated that part of the French expeditionary force, which had been placed under the command of General d'Amadé, was then on its way to the Levant; while on March 19 the British Admiralty announced that ample naval and military forces were available on the spot. Then on April 23 it was revealed that the commander of the expeditionary force was General Sir Ian Hamilton. The announcement of the beginning of the combined attack on Sunday last was made in the following War Office and Admiralty *communiqué* issued at 5.35 p. m. on Monday (April 26):

"The general attack on the Dardanelles by the fleet and the army was resumed yesterday.

"The disembarkation of the army, covered by the fleet, began before sunrise at various points in the Gallipoli Peninsula, and, in spite of serious opposition from the enemy in strong entrenchments protected by barbed wire, was completely successful.

"Before nightfall large forces were established on shore. The landing of the army and the advance continue."

At 11.30 on Tuesday night the War Office and the Admiralty made the following announcement:

"After a day's hard fighting in difficult country, the troops landed on the Gallipoli Peninsula are thoroughly making good their footing with the effective help of the navy.

"The French have taken 500 prisoners."

The following telegram has been officially published in Cairo:

"The Allied forces, under Sir Ian Hamilton, have effected a landing on both sides of the Dardanelles under excellent conditions; many prisoners taken, and our forces are continuing their advance."

An official note issued from Paris on Tuesday (midnight) says:

"In the landing effected on April 25 by the Allied forces on both shores of the Dardanelles, the French troops, comprising infantry and artillery, were especially designated to operate at Kum Kaleh, on the Asiatic coast.

"This task was accomplished with entire success, with the support of the guns of the French fleet and under the enemy's fire. Our troops succeeded in occupying the village and in holding their ground there, notwithstanding seven counter-attacks covered by heavy artillery, which were delivered by the enemy during the night.

"We took 500 prisoners, and the enemy's losses appear to be high. The general disembarkation of the Allied forces continues under excellent conditions.—*Army and Navy Gazette*, 5/1.

BRITISH POSITION.—On April 28 the War Office issued the following:

"In face of continual opposition the troops have now established themselves across the end of the Gallipoli Peninsula from a point northeast of Eski Hissarlik to the mouth of the stream on the opposite side. They have also beaten off all attacks at Sari Bair, and are steadily advancing. The Turks had made considerable preparation to hamper any landing. Wire entanglements under the sea as well as on land and deep pits with spikes at the bottom, were among the obstacles overcome by the troops."

Eski Hissarlik is situated about 1½ miles east of Seddul Bahr, and is surmounted by an old battery. Sari Bair, or Sari Mountain, is situated at a point NE. of Gaba Tepe. The dominating range of which it forms a part is one of the highest ridges in the whole peninsula. Its summit commands the lower-lying country which slopes down to the Dardanelles. In the Greek report on Tuesday, the landing places were given as the western extremity of the peninsula, near Souvlis; the promontory of Helles, near Seddul Bahr village; and the coast below Ghennikios, on the Gulf of Saros, opposite to the town of Gallipoli, besides the landing on the Asiatic side.

In the Turkish account of the landing, the places of disembarkation were said to be four in number on the Gallipoli Peninsula, namely: At the mouth of the Sighindere; in the coast district of Aviburun; to the west of Gaba Tepe; and near Tekeburun; besides in the neighborhood of Kum Kale, on the Asiatic side. Following upon an interview which M. Augagneur, the French Minister of Marine, had with Mr. Churchill, the former, in the course of a press statement, said there was no question of the Dardanelles operations being suspended, and the Marine Ministry had never supposed that the Straits would be forced without considerable preliminary work. The results desired would, however, be achieved before long. Mr. Churchill and M. Augagneur discussed means by which events might be expedited in this direction.—*Army Navy Gazette*, 5/1.

FORTS VS. BATTLESHIPS.—There seems to be little doubt that something has gone wrong with the attack of the Allies upon the forts which line both sides of the Straits of the Dardanelles. Since the grand attack in force, when three battleships were sunk and several severely punished, there has been a perceptible lull in the operations. We hear less talk about forcing the Dardanelles and crushing the fortifications by overwhelming gun-fire, and more about the necessity for capturing the positions from the land side.

Of course, the situation of the straits is a peculiarly difficult one for an attacking force, especially if the endeavor to force the straits is made from the westward. This is due to the fact that a very swift current sets from the Sea of Marmora to the Mediterranean, and that this renders it possible for the Turks to transfer the floating mine into a mobile engine of destruction. It will be remembered that the British Admiralty attributed the loss of the three battleships to the fact that the Turks let loose, at the easterly end of the straits, a large number of mines, which, coming down with the current, in due course found their quarry.

It would be an interesting *dénouement* of the naval operations of the Dardanelles, if the forts should be taken in the rear and their guns destroyed by field armies. Unless the Dardanelles forts are better protected than our own coast forts against being taken in reverse, or from the rear, the chances of their speedy reduction are very good indeed; but in view

The London Times, 4|28

ON SUNDAY THE RUSSIAN BLACK SEA FLEET, SIMULTANEOUSLY WITH THE ALLIED LANDING OPERATIONS AT THE DARDANELLES, SUCCESSFULLY BOMBARDED THE FORTS AT THE ENTRANCE TO THE BOSPORUS. IN BOTH CASES THE OPERATIONS CONTINUE

of the fact that the fortifications, at least on the European side, can readily be approached by landing parties from ships, it is fairly certain that the landward approaches are capable of offering strong resistance to attack. In which case, it is certain that the Turks, who have proved themselves to be very formidable, when, as at Plevna, they are fighting behind field works and in open trenches, will put up a strong defence. It is likely that the most interesting phase, and certainly the most elaborate, in this attempt to force the straits is yet to come.—*Scientific American*, 4/10.

TIMEO DANAOS ET DONA FERENTES.—Troy, which was impregnable to assault, fell before a ruse. The trick by which the British got their first landing party ashore at the Dardanelles, as reported by a correspondent of the Associated Press, calls to mind the famous stratagem of the wooden horse in whose belly the Greeks rode into Troy. A large collier was boarded by 2500 Tommies, who crouched out of sight behind banks of coal. Just before sundown the collier was cast adrift and allowed to bear down on the shoals near the European shore of the straits. The huge craft struck, and a boatload of men, her crew, the Turks believed, were seen to row off toward the open sea. As it was growing dark, the Turks decided not to board the collier till the following morning. When they attempted to do so, what was their surprise to find 2500 British soldiers strongly intrenched on the shore near the collier, covering the disembarkation of other troops from the British transports.—*Outlook*, 5/19.

LOSS OF "E 15."—On April 18 the Admiralty announced:

The *E 15*, while attempting a difficult reconnaissance of the Kephez minefield (in the Dardanelles) yesterday (April 17) ran ashore on Kephez Point.

Three officers and 21 men of the crew of 31 have been rescued and captured. Among them is the former British vice-consul at the Dardanelles.

Kephez Point, which has frequently figured in the news, is on the Asiatic side of the Dardanelles, and about 12 miles from the entrance. It marks the beginning of the Narrows.

Submarine *E 15* was built in 1913 by Messrs. Vickers Sons & Maxim, Barrow-in-Furness, and no official details of the later vessels of the class have yet been allowed to be published. The earlier *E* submarines had a length between perpendiculars of 176 feet; beam, 22½ feet; submergd displacement, 800 tons; indicated horse-power, 1600; surface speed, 15 knots; torpedo-tubes, 3; complement, 28. Later submarine craft are designated *V's*, *S's*, and *W's*.

AMSTERDAM, April 19.

According to a telegram from Berlin, the Turkish Headquarters Staff has published the following account of the sinking of the *E 15:*

The submarine started from Tenedos at midnight, and entered the Dardanelles at 2.20 a. m. It dived at 2.30 a. m., in order to avoid the searchlights. Carried forward by a strong current, it grounded at 6.30 a. m., with the conning-tower above water.

The Turkish batteries opened fire, and the first shell struck the bridge, killing the captain. The second shell struck the electrical machinery-room, so that the crew were obliged to leave the vessel; but the Turkish batteries continued to fire. Three persons were killed and seven wounded.

When the enemy's air machines learned the fate of the submarine they flew over the Straits in search of it, and threw bombs on the periscope and conning-tower, fearing that it might fall into the hands of the Turks.

Turkish troops immediately went out in boats to save the submarine crew. The wounded British sailors were taken to hospital, where they are receiving attention. They declare their admiration for their treatment.—*Press Association War Special, Naval and Military Record*, 4/21.

DARING BRITISH EXPEDITION TO DESTROY "E 15"

LONDON, April 20.

The Secretary of the Admiralty makes the following announcement:

The submarine *E 15*, which grounded on Kephez Point April 17, appears to have been in danger of falling into the enemy's hands in a serviceable condition, and great efforts were made by the Turks to secure her.

Attempts to destroy her by long-range fire of battleships failed.

During the night of the 18th two picket boats—that of H. M. S. *Triumph* and that of H. M. S. *Majestic*, both manned by volunteer crews, attacked the submarine.

The boats were subjected to a very heavy fire, estimated at over 200 rounds, from Fort No. 8, which was only a few hundred yards distant, and a number of smaller guns at short range.

Notwithstanding this, the submarine was torpedoed and rendered useless.

The *Majestic's* picket boat was holed and sunk, but the crew were saved by the other boat, and the only casualty was one man, who died of his wounds.—*Naval and Military Record*, 4/21.

THE "MANITOU."—Dr. Macnamara (Secretary to the Admiralty), replying to a question on April 22, said: "The transport *Manitou*, with troops on board, was stopped by the Turkish torpedo-boat *Dhair Hissar*, which had escaped from Smyrna. The crew and troops were ordered to abandon the vessel, about eight minutes being given. The torpedo-boat then fired three torpedoes at the transport, which missed. She was then driven off by British destroyers which had come up. She was chased and eventually beached herself and was destroyed, her crew being captured. While the troops were leaving the transport two boats capsized, 51 lives being lost. In one case a davit broke, and in the other case the boat appears to have been overcrowded. There is nothing either mysterious or disquieting about this affair. The essential facts were made public by the Admiralty as soon as they were known."—*Army and Navy Gazette*, 5/1.

RUSSIAN MINES SINK TURKISH DESTROYERS.—Two Turkish torpedo-boat destroyers were blown up, says a Salonica despatch, while passing through a mine belt which Russian ships had succeeded in laying across the entrance to the Bosporus while the Turkish fleet was cruising in the Black Sea. The explosions caused by the destruction of the two Turkish vessels gave warning to the remainder of the fleet, which, the despatch says, was obliged to remain in the Black Sea because no mine sweepers were available.—*N. Y. Herald*, 4/21.

FAR EAST

Naval powers in the Far East are represented as follows:

FRANCE

2 armored cruisers.
1 destroyer.
1 gunboat.
4 river gunboats.

GREAT BRITAIN

1 battleship.
2 light cruisers.
2 cruisers.
8 destroyers.
4 torpedo-boats.
3 submarines.
10 river craft.
6 sloops.
Some other small craft.
(The armored cruisers have a speed of from 20 to 25 knots, and the destroyers, 26 knots.)

JAPAN

2 dreadnoughts.
13 pre-dreadnoughts.
2 battle cruisers.
13 armored cruisers.
13 light cruisers.
52 destroyers.
27 torpedo-boats.
15 submarines.

The disposition of these ships is problematical. The more powerful ships of France and Great Britain are probably operating in other areas.

CASE OF THE "PLAKAT."—The Foreign Office issued on April 19 the correspondence between the British and German governments which has taken place through the medium of the United States concerning the British capture of a steamer conveying women and children from Tsing-tao. This vessel, the *Plakat*, was seized and taken to Hong Kong, and Germany alleges that "this procedure against the ship involves a serious violation of international law, according to which vessels entrusted with humanitarian missions are exempt from seizure by hostile marine forces." In his reply, dated March 30, Sir Edward Grey pointed out that "in the view of His Majesty's Government the conveyance of women and children from a fortress which was about to be besieged (an action which would have the effect of increasing the power of resistance of the fortress) cannot be regarded as a philanthropic mission within the meaning of the article; and it would indeed appear that the *Plakat* might more properly be considered as being employed on a service connected with the operations of war, which would, as the report points out, be sufficient to deprive a vessel of any privileges which she might otherwise be entitled to under the article in question." The Foreign Secretary then cited the case of the French refugee ship *Amiral Ganteaume*, which was torpedoed at sight, and contrasts the difference in the treatment of the two vessels.—*Army and Navy Gazette*, 4/29.

PACIFIC AND ATLANTIC

GERMANY

American Waters

Karlsruhe, light cruiser (unofficially reported wrecked).

ENGLAND

East Indies.
1 battleship.
2 light cruisers.

Persian Gulf.
4 small craft.

Cape of Good Hope.
3 cruisers.
1 gunboat.

New Zealand.
3 cruisers.
1 sloop.

Royal Australian Navy.
1 battle cruiser.
3 light cruisers.
3 destroyers.
2 submarines.

West coast Canada.
2 submarines.

West coast of America.
2 gunboats.

"ODENWALD'S" ATTEMPT TO ESCAPE.—Last week Germany submitted a note to America for an explanation of the refusal to grant a clearance to the Hamburg-America Line steamship *Odenwald*, and alleged that the shots fired by the forts of San Juan, Porto Rico, when the *Odenwald* attempted to leave without clearance, constituted an attack. The liner, it will be recalled, about 3 p. m. on the afternoon of March 21, attempted to leave San Juan, where she had been since August, but was prevented, warning shots being fired with machine guns and a 5-inch weapon, upon which she came to anchor. It is now alleged that the firing was continued for three minutes after the ship had set full speed astern. The *Odenwald*, it is reported, may be confiscated to the United States, and her commander fined or imprisoned for the attempted escape, which, had it been permitted, would have constituted a serious breach of American neutrality.—*Army and Navy Gazette*, 4/17.

The Japanese armored cruiser *Asama*, which ran ashore on the coast of Lower California on February 4, has been refloated. According to official announcement at Tokio, the *Asama* will probably be docked and repaired at San Francisco.—*Army and Navy Journal.*

BLOCKADE DECLARED.—The following notice appeared on April 27 in the *London Gazette*, dated Foreign Office, April 24: His Majesty's Government

have decided to declare a blockade of the coast of the Cameroons as from midnight, April 23-24. The blockade will extend from the entrance of the Akwayafe River to Bimbia Creek and from the Bengo mouth of the Sanaga River to Campo. Forty-eight hours' grace from the time of the commencement of the blockade will be given for the departure of neutral vessels from the blockaded area. The specified area of the blockade excludes the port of Duala, occupied by the Allies, and its bay.—*Army and Navy Gazette*, 5/1.

MISCELLANEOUS NOTES

"ENGLAND'S FAR-FLUNG BATTLE LINE."—The extraordinary diversity of the war in which our troops are engaged, and the vast extent of the world over which operations are taking place, can only be appreciated by those who read the letters which, at far too infrequent intervals, and in but scanty numbers, filter home from all the distant outposts of the empire. We know and hear most, of course, of our men in Flanders, and we believe that we are beginning dimly to understand and appreciate the silent heroism with which they have withstood, in an attenuated line, the onslaughts of the German hordes, the exposure and horrible discomforts of the icy, storm-swept trenches, the ceaseless and nerve-shattering bombardment equally of positions in the firing line and of the billets miles in the rear. We hear, too, though less frequently, of those of our soldiers who are engaged in amphibious operations at the head of the Persian Gulf, in a climate which in a few weeks must become almost insupportable, where a hot wind rages at certain seasons to which even the natives cannot expose themselves and live. Again, from time to time tidings come to us of those soldiers of the king-emperor who are fighting our battles in the dense and tropical forests of our African possessions, and who, though they only number hundreds while the armies of the continent are counted by hundreds of thousands, are exerting in their own small way a vital influence upon the issue of the great struggle. And now, too, we are beginning to hear something of the warfare which General Botha is conducting on the borders of German South-West Africa, in the great Thirst Land—a waste of desert dotted sparsely with shallow water holes; a world of desolation, not a living thing, plant, animal, or insect to be seen, only everywhere the mocking mirage. There has never been a war which has brought home to us, as has this one, the vastness of our empire, and the unity of all those soldiers, whether white, brown, or black, who are fighting and dying that it may endure.—*Army and Navy Gazette*, 4/10.

TELEGRAPHS IN WAR-TIME.—By Charles Bright.—The importance of direct and secret telegraphic communication by essentially deep-sea, "All-British," cables between the different branches of the Empire—for diplomatic purposes and for gathering together the resources of our widely scattered domains—is now forcing attention in a practical way in connection with the great prevailing war.

To be more exact, we have rendered something like a dozen German lines absolutely useless, their repair being very difficult to effect. Most of these pass under the English Channel, where their dislocation or control (for censorship purposes) is a fairly simple matter, but others are in the Pacific and Atlantic oceans, the interruption being effected—as in the case of the Azores cable—quite near the landing place. In a word, except through the "wireless" service, Germany can only telegraph to her ally, Austria, and to one or two comparatively minor European countries. It is, perhaps, possible that occasional messages may be got through the Atlantic cables, with the aid of third parties, to certain neutral states, but all messages suspected as coming from the enemy would naturally be stopped.

Pacific Cable Interruption.—On the other hand, all our own trunk lines have been kept intact, with the exception of the "All-British" Pacific line,

a section of which—that between Vancouver and Fanning Island—was interrupted on the 7th of September, a German man-of-war having that day landed a party at Fanning Island to effect the said object. This cable had experienced a great rush of traffic immediately on the outbreak of war, the receipts becoming three and a half times as much as at ordinary times. Indeed, the cable now carries about 140,000 words a week—equivalent to 7,000,000 words per annum—instead of the 200,000 despatched during the first year of working. Most of this increase is accounted for by the compulsory use of "clear" messages, but enough represented diverted traffic to prove the value of the line as an alternative and safer route in time of war.

Fanning Island—scarcely more than a desert rock—is situated about 400 miles to the southward of the Hawaiian group, the population consisting of 26 white men, 4 white women, and 260 natives. All the "whites" are connected with the cable station in one way or another. The highest point of the island is only some 9 feet above high-water mark—rendering invasion a peculiarly easy matter—and the dull monotony of life received a severe shock when the German cruiser *Nürnberg* paid its eminently informal call. On the other hand, the Germans made the most of a fleeting visit. They attended strictly to business, doing over 30,000*l. worth* of damage to the cable and station outfit, some of the instruments costing 1000*l.* each. How thoroughly the work of destruction was effected is brought to light by the fact that communication was only completely restored on the 6th of November. They even returned to the island 48 hours later to make certain that no repairs had been effected meanwhile, or no undetected reserve (duplicate) apparatus installed. The southern section (Fanning-Fiji) was quickly repaired, but the northern section (Fanning-Vancouver) was what the Germans had naturally paid their best attention to, it being considerably the longest in existence—*i. e.*, 3458 nautical miles.

Soon after the interruption, the Pacific Cable Board despatched a steamer (s. s. *Kestrel*) to the lonely island with supplies and new instruments, and the following report by the officer in command (Captain E. L. Tindall) is not without interest:

"We arrived at the north end of Fanning Island at daybreak on the 25th of September. I gave orders for the chief engineer to bank the fires so that no smoke would be visible. We crept up cautiously, and from the masthead of the *Kestrel* we surveyed the surrounding water for the presence of a war vessel, and found none. I then proceeded around the island and to the harbor entrance. We noted a ship's boat with a crew which was apparently grappling for the broken cable.

"We were greeted upon our arrival by Superintendent A. Smith and his staff, and our welcome was a genuine one. The devastation caused by the Germans was apparent before we landed, and evidence of the free use of gun-cotton and dynamite could be seen many yards from the shore. The landing buoy to which vessels make fast was demolished.

"Although none of the residents of Fanning Island had suffered any personal injury from the German landing force, the feeling against the British Government in not giving this important station their naval protection is quite marked.

"While the people of Fanning were expecting the presence of a German cruiser for about three weeks, no one really thought that Germans would actually attempt to seize the island, especially as the British Government knew the whereabouts of the *Nürnberg* and the *Leipzig*.

"The cable employees were hard at work, and were paralyzed to see a German officer at the door of the operating-room with a revolver. 'Take your hands off those keys, all of you!' he commanded.

"The men were made to line up against the wall while the sailors with axes smashed the delicate and costly instruments. A good deal of valuable mechanism was left intact, indicating that their knowledge of cable instruments was very crude.

"Another party was engaged near the shore end of the cable, trying to locate it. Failing in this, heavy charges of dynamite were planted and the cable blown to atoms. A crew from the collier grappled for the cable further out to sea with the intention of doing additional damage. Still another party planted dynamite and gun-cotton in the engine-rooms, the boiler-rooms, refrigerating plant, and in the dynamo-rooms. The explosion from these charges was terrific, but no one was hurt. A search was then made of the offices and a number of valuable papers were taken. These papers were taken aboard the *Nürnberg*, and a few hours later an officer returned and hastily summoned a detachment of men. The papers had revealed that several valuable instruments were buried—in reserve for just such contingencies; that a quantity of hidden arms and ammunition existed, and that there was 600*l.* in the office safe. The latter was blown open and the money taken. The officer in charge of this section of the expedition apologized, and said that this was the first time in his life that he had acted the part of a burglar.

"The officers appeared to have a complete knowledge of what was going on in the outside world, and seemed to be in possession of as much information as those who had been in daily cable communication with the mainland. The collier was carefully disguised, and there was nothing which would reveal her identity. She is about 2200 tons register, and had an elaborate grappling outfit aboard her, whilst her men seemed to be experts in this class of work."

It is clear from the above, as well as from other evidence at hand, that the cable would never have been disturbed but for two factors: (1) That the German cruiser and her consort sailed under false colors—the French flag; and (2) the entire lack of protection accorded to the island, on which this highly important "All-British" strategic line is landed. The present writer has always urged that each of the three intervening cable stations—*i. e.*, Fanning, Fiji, and Norfolk Islands—should be adequately fortified with guns over the cable landing of a range that will carry out to fairly deep water, where cable interruption would be a difficult and time-taking process, such as could be checked by our cruisers at sea. The following is a quotation from a report on the measures taken by the British Government to guard the cable office and cable landing of the Commercial Cable Co.—an American company—at Watervale, Ireland:

"The office building is completely enclosed by a barbed-wire fence, patrolled within by a sentry. At the office door is stationed a second sentry, to whom must be shown a pass by all persons entering or leaving. The basement windows—outside the battery and testing rooms—are blocked up with sand-bags. Preparations are now being made to close up the windows on the operating-room floor with a bullet-proof protection of galvanized iron and timber, after which we shall be working completely in artificial light. The cable landing is protected by barbed-wire entanglements and guarded; a guard is also maintained at the engine-house. The latter place is presently to be bullet-proofed, and the water-tower, by the office similarly protected. A building of blockhouses is also intended."

If such careful steps can be taken by our government to protect the property of an American company—the Commercial Cable Co.—surely it behooves us still more to do something adequate to guard against telegraphic interruptions on the Imperial State Pacific cable to Australia and New Zealand!

The Cocos Episode.—The valiant Captain von Müller, of the now defunct *Emden*,[4] also attempted one of his bogus-funnel ruses as a means of similarly taking by storm the cable and wireless station on Keeling-Cocos Island. It would indeed have been a crowning victory for this famous German officer. But it was not to be, for the ruse was detected—and well ahead—by those in charge on shore, who promptly advised by "wireless" several of our men-of-war nearby, which led to the *Emden's* ultimate doom. Moreover, a "rush" cable message was sent out to the

Navy Office at Melbourne, who acted with wonderful promptitude on the information given. It is evident that the cable and wireless superintendents—with the experience before them of what had happened at Fanning—exercised considerable alertness, besides acting with exemplary intelligence and despatch in a way that contributed largely to the result achieved.

The *Emden,* in going to Cocos Island with the idea that she would seriously damage the interests of Great Britain by cutting some very important cables, actually ran into a hornets' nest. It was thought the work of a moment, on the appearance of the famous corsair, to flash the tidings of her arrival to east and west and south and north; in short, to every point from which the signals could reach His Majesty's ships, which, under the directing hand of the Admiralty, were closing round the German cruiser.

The landing parties of the enemy did, indeed, succeed in cutting two cables (since repaired), but they were too late. The intelligence which proved so fatal to the *Emden's* career had already passed over the wires.

The story of the telegraphists' part in the sinking of the *Emden* is one of those records of ready wit and efficiency which make the best of romance. The guns of the *Sydney* sent the *Emden* on to the rocks, but those guns would not have come into play had not the telegraphist at Cocos quickly recognized the enemy in all her disguise, and despatched the warning message throughout the world, which brought the *Sydney* up in time. It is almost disturbing to think that before the boat's crew had landed from the *Emden* the warships were moving to the rescue, and London was making arrangements for repairing the cable and wireless stations. The men who perform these unostentatious miracles—and upon whom, in the last analysis, the linking-up of our scattered ships, as well as of our scattered Empire, depends—are not known to the great public. On desolate little islands, in remote alien cities, they lead the loneliest of lives. For conversation they must talk across the wires to colleagues, possibly equally lonely, a thousand miles away. They know as soon as kings and ministers what is happening in the great world from which they are exiles, but they have to keep the charge with an honor as strict as their devotion. For a full and illustrated description of the Cocos episode reference should be made to *The Zodiac*—that admirable little organ of the cable-station official.

Lessons Learned.—The war has already served to draw attention to the fact that the more cables there are between any two points in the Empire, and the greater the depth in which they are laid, the less likely is communication to be broken off.

It has also reavealed the desirability—if not actual necessity—for all our Inter-Imperial communicating links being placed under a Government Board of Control in strategic and general national interests, with a fixed and lasting policy as to administration to meet all such conditions. Surely the control of our Inter-Imperial cables should at least be taken over in these emergencies, just as the railway systems—with perhaps less reason—have already been. Occasion may be taken here to mention that cable rates, under a certain amount of pressure, have been reduced to a somewhat greater extent than railway rates—other things being equal in regard to monopoly, etc. The financial position of the cable companies is, however, of a sort that would justify enterprise more than in the case of railways. Had an authority of this nature been in vogue previous to the war, the charges for ordinary rates would not have been maintained at the same high figure under a state of censorship, for a board of this class would have throughout studied public (national) interests as a whole, rather than the admittedly human interests of shareholders. For satisfactorily carrying out the proposed government administration scheme all the cables landing on our coasts might suitably be connected direct to the general post office and hence with the war office—and the cable stations sealed up—during warfare.

Again, had such a central authority existed it is pretty certain that the censorship of cablegrams would have been more effectively dealt with—under a single organized and uniform system. For a considerable time all

code messages were entirely "banned"—with very serious business results, both as regards cost and delay. Even now messages are frequently stopped altogether without any intimation being given to the senders, though bona-fide English firms. It has to be remembered that shipping companies, etc., are normally in the habit of despatching cablegrams in the same way that the ordinary individual communicates by letter. Thus, they have experts continually working at the perfection of their code, which often costs over a thousand pounds sterling. By the disuse of codes the "cabling" expenses of such firms are increased nearly fourfold. For instance, a cablegram to Australia, which ordinarily costs about 5*l.*, will in plain language run into anything between 15*l.* and 20*l.* Indeed, it is stated by a certain firm that the war cabling restrictions had cost them, during the month of August, over 750*l.*—*i. e.*, at the rate of nearly 10,000*l.* a year (!), whilst, on the other hand, owing to the interruption of some of the overseas mail services, the call for favorable telegraphic facilities is all the more marked. Then, again, business firms naturally attach considerable importance to secrecy, and there is always the possibility of an ordinary clerk in a cable company's office, belonging to a far-off market, disclosing —maybe inadvertently—the contents of a plain-language message to his personal acquaintances or to the competitors of the sender. Yet it is an open question whether plain-language phrases are not far more readily and effectively used to convey another meaning by the German spy and such like—as the notorious Lody did, indeed—than any commercial codes. In other words, plain-language code is, in actual fact, probably a greater danger than any ordinary commercial code. Thus, the important point for a censor to concentrate his attention on is, really, the actual origin of a message and whom it is intended to reach.

On the other hand, that really efficient censorship is a first necessity for the satisfactory administration of our Inter-Imperial communications in time of war should be fully recognized. Unfortunately, however, it may be gravely doubted whether this condition prevails, largely on account of extreme pressure and lack of the necessary special knowledge and experience in those to whom the censorship duties are entrusted. Were a satisfactory Board of Control established for the administration (especially during war-time) of all our Inter-Imperial telegraphic links—such as I have frequently suggested (notably in a paper read before the Royal Society of Arts on April 28, 1914, on "The Administration of Imperial Telegraphs" (vide *Jour. Roy. Soc. of Arts*, vol. lxii, No. 3312); also *Nineteenth Century*, July, 1914), it is pretty certain that the censorship of cablegrams could be more effectively dealt with than at present. This is assuming that the board were not mainly confined to considerably overworked military officers with no experience in cable working. A soldier, however smart he may be, can scarcely be expected to know all about cable matters any more than a civilian can about military tactics. That those responsible are doing their utmost to meet requirements there can be little question, but unfortunately that is not everything. It has been sometimes said to be characteristic of this country that those responsible for the administration of our great services usually have no knowledge of the tools the operations of which they have to direct. However that may be, is no other talent available amongst those anxious patriotically to serve their country during the war? In any case, there is fairly conclusive evidence that messages of an apparently innocent character are being got through by the enemy which in actual fact have had an inner meaning (to someone not disclosed as the ultimate receiver) altogether opposed to British interests and of first service to our foes. It is surely of comparatively little use our cutting off Germany's means of communication if we allow the enemy (as we undoubtedly have been doing) to obtain and despatch telegrams through British or neutral lines—even those landing on our own shores! As a matter of fact, there has been a considerable and otherwise unaccountable increase in the number of so-called neutral cablegrams (passing through neutral countries) during the war.

Censorship can readily be effected where full control exists, but not so, of course, where that state of things does not prevail.

Wireless in War Time.—Let us now take up-to-date stock of the position of wireless telegraphy in connection with this great war. The art has provided, as it were, a new organ of sense to commanders both on land and sea, to enable them to determine without delay the state of affairs at very distant points of the field, and to issue orders accordingly. Thus wireless has proved of considerable value. It may nowadays be said, indeed, that on the ability of a government to communicate instantly with its naval and military officers—and they with one another—is likely to depend in large measure the final outcome of the struggle in which we are now playing so vital a part. According to the Official "Eye-Witness" at the front, the Army Signal Headquarters Office is the nerve-center of the army in the field, receiving messages from all quarters by wire telegraph, telephone, wireless telegraphy, and motor cyclists. About 3000 messages are, in fact, handled daily.

"Wireless" has, however, also proved to be a somewhat uncertain and distinctly two-edged weapon to rely upon. The very first day after the declaration of war revealed the comparative ease with which a "wireless" system may often be "jambed," This was effected by the enemy's "wireless" station at Swakopmund, near Omataka, German South-West Africa, the result being completely to swamp—by a higher power—all signals received at Cape Town, 850 miles off. On the other hand, a few days later a British cruiser entirely destroyed the wireless station at Dar-es-Salaam, German East Africa. A number of other wireless stations have since been put out of service and are no longer available for communication purposes, and these are set forth in the last official list issued by the Berne Telegraph Bureau. A memorandum issued by the German Colonial Office on the course of events in the German colonies contains references to the more or less complete interruption—so far as the German Empire is concerned—of communication by cable and wireless telegraphy. Just as Germany controls but few colonies now, so, similarly, she has very few wireless stations left, and none at all in the Pacific. Among them is Togo (German West Africa), the biggest wireless station in the world outside Europe, which had been in existence about three years, and had kept up nightly talks with Berlin throughout. This we should have "wiped out" before capturing Togoland; but, unfortunately, the Germans destroyed it previously to our invasion, which was really effected mainly for the set purpose of acquiring this wireless station—partly in order "to listen in" to wireless communications from the enemy's wireless headquarters at Nauen, near Berlin. Besides being in communication with Nauen—3450 miles distant—Togo was also in wireless touch with various stations in the Cameroons, with Windhuk in German South-West Africa, with Tabora, German East Africa, as well as with the Paloos and Caroline Islands. This immense station at Togo (near Kemina) had served, in fact, as a big receiving and distributing center for messages from Berlin to Germany's African possessions. Through it also German ships in those waters could be warned and German cruisers instructed.

But though the Togo plant is not available to us for picking up the official messages which are continuously sent out from Nauen, the Marconi Company has been doing highly useful work at their stations in reading off the Nauen signals, and also those wafted forth from the new—and still higher power—station at Hanover. A large proportion of these messages consists of false versions of war occurrences (partly in English) for the benefit of the United States and other neutral countries, whom Germany wishes to impress. If it were thought desirable, the signals could be effectively stopped or rendered unreadable by jambing—*i. e.*, by transmitting from any of our high-power stations a series of impulses of corresponding wave-length so as to drown down the German signals, thus preventing their reaching Tuckerton or other wireless stations. But it is thought, on

the whole, better to permit the emission of false statements to proceed, in order to note their purport, through the Marconi stations. As, however, the writer took occasion to suggest almost at the commencement of hostilities, it might be well to counteract the effect of this "news" in neutral countries by disseminating accurate particulars of the war from the great Eiffel Tower station.

Whilst "wireless" has more than once done splendid work as an agent for detecting crime and detaining evil-doers, it has also frequently served as a ready weapon to the unscrupulous—*inter alia*, by the transmission of unauthorized signals. Since the outbreak of the war it has been largely used by Germany in this way. Thus it is that several British merchant vessels have been ensnared by the enemy; and, on the other hand, there can be little doubt that the enemy's cruisers have more than once been well served by secret wireless stations—partly on neutral territory. Again, stories are current in well-informed quarters that in the United States the Germans are systematically using wireless telegraphy to serve military ends. The American radio-telegraphy service is strictly controlled by the U. S. Government, and the plan seems to be to install secret plants in inaccessible places and send messages to cruisers, couched in apparently innocent language. American newspapers recently had something to say about one such plant which was alleged to be situated among the almost unexplored tumble of mountains, forests and water which cover most of the State of Washington on the Pacific coast. The code employed is said to make the messages resemble harmless business telegrams of quotations, prices, etc. In contradistinction to cable telegraphy, in the case of "wireless" the origin of a message can never be known or traced for certain, and messages that may seem to be coming to a British warship from the Admiralty—or *vice versa*—may really be bogus messages from the enemy for the purpose of misleading our forces. Though in her adventurous rovings the now defunct *Emden* mostly refrained from sending wireless signals, she appears to have been throughout a ready "listener" on a wide scale, and was always well acquainted with the whereabouts and projected movements of our ships without revealing her own.

That wireless telegraphy—like the carrier pigeon—is of great service to espionage is clear; and there is weighty circumstantial evidence that a good deal of important information has been thus disseminated by spies from our shores to German vessels at sea, notwithstanding the prohibition of the private wireless apparatus. Indeed, although no single station of sufficient power could successfully transmit to Germany without detection, it is quite possible that, by means of a chain of small power stations with hidden aerials, messages might be transmitted a few miles at a time, and thus get across the North Sea or the Channel. A comparatively small station with an aerial hidden in the roof of a house, or carefully trained up a flagstaff floating the Union Jack, may well transmit over a distance of 100 miles. Such stations could, indeed, easily pick up signals sent out by our own "wireless" stations, whilst also receiving instructions from enemy "wireless" stations.

The existence of "private" radio-telegraph stations in different parts of the world has already been the subject of much diplomatic correspondence, and will undoubtedly be made the occasion for stringent international regulation in days to come. Meanwhile, on the very outbreak of hostilities the postmaster general—quite rightly—not only vetoed the use of all private radio-telegraphic stations in this country, but even the possession of wireless apparatus of any kind. (The Wireless Society of London has done much useful work in watching for improper uses of wireless. Moreover, the *Wireless World* affords considerable information on the subject.)

It only remains to be said that, with at least five government departments separately concerning themselves in wireless telegraphy more or less actively, there is the same need for a central authority here as with cables; and there would be everything in favor of a single government controlling

board for the combined administration of our Imperial system of cables and wireless, with representatives thereon of all the departments concerned. Such a board would get over much long drawn out inter-departmental correspondence, besides ensuring a uniform policy—so especially essential in time of war. Moreover, stricter secrecy could then be ensured.

Partly in view of the strategic aspect of telegraphy, the following data relating to wireless stations throughout the world will probably be of interest. There are, altogether, 629 such stations. The United States leads with 198; the British Isles come next with 101, Canada 41, France 39, Italy 38, Russia 31, Brazil 29, Germany 29, Norway 27. China and Sweden have only three stations each in working order, but several more are being erected.

Yet the rapid growth in the number of wireless stations has in no way checked the increasing mileage of submarine cables. In the past six years this network has progressed by 125,000 miles, of which 35,840 belong to different nationalities and about 90,000 to various private companies. There are, in fact, now some 290,000 miles of cable in operation at the bottom of the sea, of which 154,000 are British, 62,700 American, 27,000 French, 27,000 German, 10,00 Danish, and 9000 Japanese.

Enough has perhaps now been said to show that the war experience so far in wireless telegraphy only tends to prove that, whilst of enormous value during hostilities as in peace times, it is still a very two-edged weapon, such as no complete reliance can be safely placed in, and that it certainly does not at present serve as a suitable substitute for cable telegraphy wherever the latter is available. Indeed, the following bygone opinion still holds good:

To believe it possible to discharge an electric impulse into ether, and expect it to be as reliably communicated through the range of Nature's atmospheric and electrical phenomena to its destination as a current can be passed through an unbroken electrical conductor connecting two points, requires a faith in man's conquest over Nature which is altogether beyond comprehension.—*The Nineteenth Century*, April.

A NAVAL RETURN FOR PAST EXPENDITURE.—General Botha is steadily working his way into German South-West Africa, and ere many more weeks have passed we may reasonably hope to see the German flag hauled down and the Union Jack hoisted in even the most remote corner of this place in the sun. There will then remain German East Africa only of all the colonies the Kaiser had added to the German Empire in pre-war days. This will be a harder nut for our land forces to crack, but Indian troops are plentiful and full attention will be given to the work when we are a little slacker in other quarters of our far-reaching activities. Let us ever remember that the navy has enabled us to add all these German colonies to the British Empire, and that together they are worth more than the whole of our present navy has cost the country for the last 20 years. That will enable us to calculate whether keeping a first-class navy, at the very top hole of efficiency, is a paying game for a country like ours or not.—*United Service Gazette*, 4/22.

THE BRITISH LABOR PROBLEM

Bad Repairs on a Warship.—Captain Brian H. F. Barttelot the captain-superintendent of the Clyde, writes on March 25 as follows:

"In accordance with the directions contained in your telegram of the 20th March, calling for proposals that will facilitate the completion of H. M. ships, I have the honor to report on the effect of drink on the output of work.

"From close observation—and my opinion is shared by all the managers of shipyards—the amount drunk by a section of the men is much greater than it was before the war, and it is on the increase. Those principally concerned are the ironworkers and shipwrights, and on their efficiency the output entirely depends.

"The sole reason for this heavy drinking is that the men earn more money than they know what to do with.

"In a shipyard last week where a warship is under repair, work on the inner bottom of the ship was so badly carried out as to suggest at once on inspection that it could not have been done by men who were sober. It was dangerous, and had to be condemned. In the same yard (and it is common in most others) drunken men, nominally at work, have had to be removed. Men are bringing or smuggling liquor into the yards in bottles, and facilities for buying spirits in bulk at public houses and at licensed grocers must be stopped."

Serious Situation on the Tyne.—Captain Greatorex, R. N., Director of Naval Equipment, writing on March 4 to the Third Sea Lord, says:

"The condition of labor is deplorable, and the men are in a most uncertain and undependable state. This is so serious that at any time the whole of the shipbuilding work on the Tyne may come to a standstill.

"Sunday working is of little value, as the money paid for Sunday work leads to abstention from all work for often two days, and a Sunday worker will frequently not return till Wednesday.

"The money earned is sufficient to satisfy the men's standard of living, and anything extra beyond ordinary wages encourages abstention to enable loafing in public houses, instead of doing their honest day's work. The opening of public houses at early morning conduces to abstention from work till after breakfast, and then the work is unsatisfactory, due to the amount that has been imbibed."

Admiral Jellicoe's Concern.—An extract is given from a letter, dated March 26, from Admiral Sir John Jellicoe to the First Lord of the Admiralty:

"I am very uneasy about the labor situation on the Clyde and Tyne. I have sent a telegram or two lately about it. You may think I am exceeding my sphere of action in doing so, but the efficiency of this fleet is so affected by it that I felt it my duty to wire.

"To-day an officer in a responsible position arrived. His account of things on the Clyde was most disquieting. He said that the men refused altogether to work on Saturday afternoon, that they took Wednesday afternoon off every week (if not the whole of Wednesday), and worked on Sunday because they got double pay for it. He said also that they only worked in a half-hearted manner.

"My destroyer dockings and refits are delayed *in every case* by these labor difficulties, and they take twice as long as they need do. I feel that you ought to know the facts, and so put them before you now. * * *."

Reports from Armament Works.—The reports from armament works are not as serious as those received from the shipyards. They indicate, however, that much time is avoidably lost in some of the most important works. For example, this is a report received on March 19 from important works engaged in the manufacture of munitions:

"Some drastic restrictions are absolutely necessary if largest possible output of certain war munitions is to be obtained. * * * Among some shell workers there is a considerable amount of lost time due to their drinking habits. With the better class mechanics, the time lost due to drinking is comparatively small, but in the case of laborers and the semi-skilled trade it is a very serious item."

Another most important firm reports:

"Speaking generally, margin of lost time allowed by us before the war has now to be trebled. Condition much worse in shipyards. Much of this loss of time is attributable to drink."

In another report from these works it is said:

"Loss of time from drink most noticeable in shell department, about 10 per cent of total time worked."—*London Times*, 5/3.

Book Department

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NAVAL PUBLICATIONS

BOOK REVIEWS

"Outlines of International Law." By Rear Admiral Stockton, U. S. N. (Scribner).

This work was undertaken by Rear Admiral Stockton at the request of the publishers that they might bring out an up-to-date text-book in supersession of older books. The new work deals more thoroughly, though not less concisely, with the subdivisions of International Law. The subject is conveniently codified, and is divided into five parts: 1. Introductory; 2. States in International Law; 3. Intercourse of states in time of peace; 4. War relations of belligerents; 5. Relations between belligerents and neutrals. It is, in a sense, an expansion of the author's Manual of International Law (for naval officers) which is the present text-book at the Naval Academy.

There is a short chapter on aerial warfare. Sovereignty of the air appears to be unsettled, although this is a matter of jealous concern to the Powers in their peace relations.

The book closes with a chapter on open and unsettled questions in maritime warfare. The author, having been one of the United States delegates to the London Naval Conference, speaks with peculiar authority on these unsettled questions. He urges upon the United States to become a signatory adherent to The Declaration of Paris (1856). The United States then based its refusal to sign on the absence of immunity from capture in war of private property at sea. The author says: "The practice of this capture is almost universal; it includes among those who exercise this belligerent right the United States itself . . ." It is being exercised by the belligerents at the present time, and, in all probability, no power will ever sign away this means of indirectly injuring an enemy. Certainly the United States would make a grave mistake, in the light of current events, now to bind herself to forego this belligerent right in the future.

Other questions unsettled in principle are:

(1) Length of time, on outbreak of hostilities, during which an enemy merchantman in port should be permitted to depart with immunity from seizure. On the outbreak of the Spanish War, the United States gave the Spanish merchantmen 30 days to load and depart with immunity from capture, provided they were carrying innocent cargo. On the outbreak of the War of 1914, Great Britain proposed to Germany 10 days of grace, but Germany did not respond. The result was that Great Britain interned,

but did not seize, German merchant ships, announcing that such would be released when war ended.

(2) The question whether the character of goods found in an enemy vessel is to be determined by the domicile of the proprietor or by the nationality of the owner of the goods. This is understood now to be settled, each case as it arises, according to the prize laws of the captor's country. The American practice makes the character of the ownership depend on his "trade domicile in war." There will exist the right of appeal under the International Prize-Court Convention, whenever that convention becomes universally ratified; although, even then in the case of the United States, such an appeal would be a blow to the prestige of the U. S. Supreme Court, whose decisions heretofore in prize causes have commanded world-wide respect. But the ruling of the State Department in the matter now is, that as no other government has ratified the Prize-Court Convention, that convention is not binding on the United States.

(3) The question of conversion of merchantmen into ships of war on the high seas or in neutral ports. The United States contends that this conversion can only be accomplished in the country's own ports, and it opposes conversion on the high seas or in neutral waters. Others contend that merchant ships "might voyage from one neutral port to another, receiving the treatment of merchantmen, remaining in port indefinitely, taking in frequent and unlimited supplies of all kinds, and then suddenly assuming at sea the belligerent character with its consequent activities." It would seem that there is no hope of an agreement to prohibit conversion on the high seas.

(4) The use of floating mines on the high seas. It would seem that the present usage in this respect is governed by no law or agreement.

(5) The opening to neutrals of trade closed in peace.

(6) The launching of projectiles from balloons.

(7) The treatment of submarine cables in time of war. This is not fixed by convention.

At the end of each chapter is found a convenient list of "topics and references" bearing on the subject matter of the chapter; and following the text of the book is a comprehensive "list of authorities consulted," from which the reader appreciates the vast amount of material out of which the meat of this work has been extracted and conveniently gathered in a nut shell.

The preface was written after the war broke out; the book is up to date and thus is a timely handbook, since "there have arisen more vexed questions in international law during the first six weeks of this war than during the entire period of the Napoleonic contests."

In addition to the above, which will ultimately be among the subjects discussed in future international conferences, there are, requiring settlement, the treatment of non-combatants with the exaggeration of the sanctity of the fighting forces; and the use of false colors.

W. W. P.

"Our Navy and the Next War." By Robert W. Neeser. 205 pages. (New York: Charles Scribner's Sons.)

The book is a laudable effort to interest and inform the average citizen concerning the navy and its relationship to definite American policies affecting international relations, so that, extending his vision beyond mere local affairs, he will understand that an adequate, well-proportioned, efficient navy is a national necessity.

The author apparently assumes that, broadly speaking, the deficiencies and defects of the navy are fundamentally due to the general indifference of citizens. He would do what he can to eradicate that baneful indifference. The title hardly is descriptive of the subject matter in the book.

The author evinces a comprehensive general understanding of the condition and requirements of the navy and of the relationship between national policies and adequate naval strength.

Of course, the opinions and conclusions expressed are his own. Should they be subjects of discussion, there would develop decided disagreement with the author on numerous points. Considering the largeness and importance of the subject, the book seems to have been rather too hastily written, and a more critical and rigorous revision of the text before publication would have improved it. There is a lack of well-formulated continuity of theme, and there are some seeming discrepancies in statements. The writer touches upon naval organization and administration, instruction of children in United States history, integrity of politicians, wisdom of statesmen, military and naval policy, evolution and progress, naval material and personnel, national policies and international relations, employment of the fleet, military and naval requirements, council of national defence, peace preparations against war, etc. Such a range is too great for a "popular" book of small size. Each subject can be but superficially and inadequately treated.

The forcefulness of argument is impaired by some statements that may be impugned. For example, the careful reader naturally will do some figuring of his own when he reads (on page 11) "the United States has only one-tenth of one per cent of its men trained for war." Counting the trained men and officers of the navy, marine corps, army, and of the efficient militia, and taking their proportion of the men in the country, he would figure out a much larger percentage.

However, the various features of the big subject thus comprehensively and interestingly presented by the author should lead the thoughts of the reader to large fields for beneficial contemplation. The thing desired is thought about this important subject. Discussion and criticism of the book will tend to stimulate such thought. Logical thinking, with discussion and criticism, will most largely tend to a correct conclusion and decision by the citizens of the United States.

To this end, it appears very desirable that intelligent men should read this book and well consider the matters it presents. Then might they reconstruct the first sentence of the preface to read "the intelligent American people need the support of the United States Navy." H. B. P.

"Naval Courts Martial." By David Hannay. Cambridge Univ. Press (Putnam's Sons, New York Agents), 1914. xlvii + 210 pages. Price 8s.

Mr. Hannay's volume is based on the original reports of naval courts martial from 1680, when the preservation of such reports first became a regular practice, to about the close of the 18th century. Something over 100 typical cases are mentioned or narrated, illustrating (according to chapter headings) discipline; impressment, plunder, and false muster; mutiny; murder; and losses in action and shipwreck. The writer touches but briefly on the origin and development of naval courts, and he avoids as a rule the historically important and hence better-known cases, his purpose being rather to portray "the ways, the character, the morality, and the language of the whole seafaring body" in the 18th century King's Navy. With this material and this purpose he gives us a picture both amusing and instructive of the seamy side of naval life.

"There is," says Mr. Hannay, "one class of cases of which I shall not be expected to speak at all." Very prudent, no doubt; but one could almost wish that his standards in these matters were either 18th or 20th century, instead of Mid-Victorian. It is well enough to be told that in 1699 a certain lieutenant, drunk and bawling at the top of his voice on the quarterdeck, called his captain a "vile, trooperly fellow," and was convicted of using "scurvy" language; or to be reminded that the conventional 18th century epithet for midshipmen was "snotty." But one cannot believe that the range of naval invective in that period was in general so limited as the writer states, and one would like to hear the proper terms of disrespect for the higher ranks of the service.

One could wish also more frequent quotation of petitions, depositions, etc., redolent as these often are of the forecastle, and rich in cruel and unusual abuse of the King's English. Witness the following "humble petition" of the mutinous ship's company of H. M. S. *Defiance*, addressed to their first lieutenant:

"Sir. We humbly hope you will stand by us in this our undertaking which we will gratefully return in all weathers in all hardships whatsoever be them ever so great or dangerous.

"We are fully determined never to sail with Captain Jacobs from this here place, from what we have experienced since we left England we may easily know our predestination he has broke his word both with our admiral, and his ships company in many measures since we left Torbay and for future we are likely to live in oppression and poverty whilst governed by him, our intentions is to fight for our King and Country, and as far as we can imaging (sic) of late he has no regard to it."

The book if full of information of all kinds, though often fragmentary and incidental, regarding conditions in the old navy. Flogging, for instance, was at first less frequent and severe, but increased towards the close of the 18th century as a result perhaps of the non-descript character of the crews. Large numbers of the latter, it appears, were foreigners, either pressed into the service or former prisoners of war. Fireships were still in use, but were evidently ineffective and retarding elements in a fleet

at sea. Yet if there be any potency in names, one feels that Captain Wooden of the fireship *Blaze,* who fell behind and had to sink his ship to avoid capture by the "Diegos," ought to have had better luck. Cruel orders and stupid obedience to them are illustrated by the case of Master Fenwick of the prison ship *Admiral de Vries* at Jamaica (1801), who had been told to fire on all escaping prisoners, and killed 14 out of 15 who were seeking to get ashore in empty water casks, by firing at them through the bung-holes. The fifteenth victim jumped overboard and was shot there.

Further illustration of the contents of the book is unnecessary. But the suggestion may be hazarded that the records of our own courts martial in the early days might provide material of similar interest and value.

A. F. W.

"Sea, Land and Air Strategy." By Sir George Aston, K. C. B., etc. Little, Brown & Co. 308 pp. $3.50 net.

The introductory chapter of the book deals with the general considerations which must be taken into account in deciding upon what may be called the grand strategy of a nation; and it is shown that the influence of the population upon strategy is such that, if those responsible for handling fleets and armies are to have a free hand in opposing the forces of the enemy, there must be foresight and organization to provide for the well-being of the nation which uses such fleets and armies as instruments of policy.

The succeeding chapters deal with the study of strategy pure and simple. The subject being sub-divided and a chapter devoted to each of the following: Preparations and War Plans—Objectives—Concentration—Dispersion—Lines of Communication—Fortification—Coast Defence—The Invasion of Islands—and, so far as it is possible to do so, each of the above subdivisions is considered from the point of view of its bearing upon (1) Land War—(2) Sea War—(3) Amphibious War—There is also a chapter "On Air Warfare" and, although it is stated in the preface that "Air strategy must be based largely on surmise until more experience is forthcoming of the employment of aircraft under war conditions," the deductions drawn in this chapter seem to have been very generally confirmed by the experience which has been gained since the book was published.

This book is a very valuable contribution to the literature bearing on strategy. It covers the subject very completely, treating it in considerable detail and in a very concise manner. The method of treatment is unusual and highly interesting as it leads up to and deals to some extent with the combined strategy of fleets and armies. A subject which the author claims has not yet received the attention to which its importance entitles it.

J. R. P. P.

"Defenseless America." By Hudson Maxim, Hearst's International Library Co. 308 pages.

For some years a few thoughtful Americans, outside the military and naval services, have been considering carefully the possible dangers that face us as a nation, and have been asking the question, "Are we, as a nation, reasonably prepared to meet such dangers"? While officers of the armed forces of the United States have been fully aware of the dangerous conditions, their representations and arguments have been considered by the country at large as the efforts of special pleaders who cried "Wolf" from reasons more personal than patriotic.

The suddenness with which the present European War was started, the disastrous effects of unpreparedness as there shown, and the realization that we as a neutral nation might become involved, have aroused a widespread, though at present rather nebulous, feeling that we as a nation are not prepared as we should be.

Since last August many articles dealing with our international relations and of our state of preparedness to meet conditions that may arise therefrom have appeared in various periodicals, or in the form of books, with the object in view of bringing the thinking people of the United States to a realization of the dangers that confront us and of the steps that are necessary to ward off or to meet them as the case may be.

When a man standing particularly high in the scientific world, and whose life and work have been devoted largely to matters pertaining to the military and naval professions, publishes in book form the result of his studies on the question of our state of preparedness, or lack of preparedness, under the informing, if startling, title of "Defenseless America," it behooves the country at large to give, at the very least, careful attention to what he has to say.

In the preface Mr. Maxim states: "The main object of this book is to present a phalanx of facts upon the subject of the defenseless condition of this country, and to show what must be done, and done quickly, in order to avert the most dire calamity that can fall upon a people—that of merciless invasion by a foreign foe, with the horrors of which no pestilence can be compared."

In the introduction, under the heading "Our Great Obsession" he expresses the opinion that, "We, the people of the United States of America, are at this moment, and have been for many years, afflicted with a dominating egotistic obsession concerning our greatness, our importance, and our power, while we correspondingly underrate the greatness, the importance, and the power of other nations and races. Our hitherto isolated and unassailable geographical position has enabled us to utilize our unequaled resources to become the greatest industrial and the wealthiest people in the world," and that, "Our enormous wealth and inexhaustible resources have been, and still are pointed out as reasons why we require no armaments, although, as a matter of fact, they are the strongest possible reasons for armaments of a magnitude proportionate to that

wealth and to those resources," particularly in view of the fact that believing "we can lick all creation without any preparation, we are going to act as though it were true," and so force some country into declaring war against us. It naturally follows from this that he believes, "We have arrived at a time when we must decide whether or not our safety can be better secured and peace maintained with armaments or without armaments."

While the book was evidently written for non-technical readers it contains much of interest to, and is well worth the reading by, officers of the military and naval services. The chapters are arranged in logical sequence and contain many quotations from the writings of men prominent in public life and in the military and naval professions, the excerpts being used as texts to show the dangers that confront us as a nation and the necessities of our national defenses. Chapter I "Dangerous Preachments," is devoted largely to a discussion of what the author considers the mistaken ideas underlying the arguments of members of peace and anti-armament societies: he discusses briefly the stand taken by some prominent disarmament advocates that munitions of war should be made only by the government on account of their belief that private manufacturers are apt to foment war in order to provide additional demands for their products. He believes that "there is no one lesson which history teaches us more plainly than that the possession of wealth by a defenseless nation is a standing *casus belli* to other nations" and that those who advocate disarmament should read history to ascertain whether or not the experiment is a new one, and if not, to learn what has been the fate of those nations that have failed to make the provisions necessary to defend their sovereignty.

In Chapter II is discussed the question as to whether or not law can be substituted for war, with the conclusions that all law to be effective must be backed by force; that arbitration may solve some difficulties, but that there are bound to be many questions arising between nations, particularly in cases where different races are involved, which cannot be so settled; and that occasions are bound to arise where a righteous war is preferable to a dishonorable peace.

Chapter III is devoted to a short discussion of, as the author terms it, "Our Inconsistent Monroe Doctrine"; a brief account of its inception and development is given with some of the consequences which logically follow our not being prepared to enforce it.

Chapter IV—"Modern Methods and Machinery of War," is one of the most interesting and instructive features of the book, and well worth careful reading by officers of the Naval Service. He considers that the beliefs of disarmament advocates that "not one of the great nations has the slightest desire to be other than friendly with the United States," that "invasion is an impossible contingency," and that "there is no other country in the world so well equipped to repel invasion or make it so hot for an enemy should he land as to make him exceedingly sorry he ever tried it" are all wrong; that it is his opinion "that, whichever side wins, the United States will likely have to fight the winner within a short time after the war

is over"; and that the command of sea once gone, we could not prevent the landing of an enemy force capable of occupying, or at least dominating, that section of the Atlantic States from which practically all our munitions of war would have to be drawn. War is becoming more and more a matter of machinery and of trained mechanics, no matter what the branch of the service, and when the machinery (guns, equal to the best, ammunition, etc.) and the trained personnel are lacking, numbers are impotent and simply add to the killed, wounded and captured; his description of a battle under these conditions is short, but to the point.

Chapter V is devoted to the needs of our army, and some interesting statements are made, particularly in regard to lack of reserve munitions and auxiliary troops, and in regard to the vast quantity of artillery ammunition expended in a modern battle. He considers that the prevalent belief in our security from sudden attack, due to our isolation, is based on a misapprehension of actual conditions. Modern war comes quickly, and the nation prepared, and so able to take the initiative, has a great advantage; that initiative will be denied us as "Never yet have we perceived the important truth that in this age of war, machinery requiring months and years to create, isolation by time is equivalent to isolation by distance." Another point brought out is that while men may be trained in a comparatively short time if trained officers are available, to make efficient officers requires years of training. There is also a short discussion as to the value of military training to the country from an economic standpoint.

In Chapter VI is discussed the "Needs of our Navy," and as his discussion is based largely on published writings of naval officers, or of those connected with the navy, there is comparatively little, except the side lights, with which officers of the Naval Service are not familiar.

In Chapter VII "Language of the Big Guns," he gives a brief account of the development of modern powders and explosives and of the race between projectile and armor, with the victory of the former over the latter. He concludes "that an ideal fighting ship would be one having very great speed, carrying very large and powerful guns, and protected by armor plate of but moderate thickness," and that "If Uncle Sam would listen with an understanding mind to the language of the big guns now speaking on land and sea, he would immediately build a large number of huge howitzers. He would build a large number of good roads, capable of standing the tread of these howitzers. He would build as well a goodly number of battle-cruisers, as big and as fast as any afloat on foreign seas, and armed with guns ranging as far as the guns of any foreign power."

Under the heading "Aerial Warfare," Chapter VIII, he compares the aeroplane and dirigible, discusses the limitations of the aerial bomb, and regrets that while the United States has frequently taken the lead in developing and perfecting material for war purposes, it has always stopped short when it came to providing itself with what it needed.

The remaining chapters are devoted to a consideration of economic conditions; the value of proper armament as an insurance against national disaster; the dangers of not encouraging private firms to build up means

of providing war munitions; and the good and evil results that follow peace and war, closing with the conclusions that, "The great aim of the peoples of the nations should not be for a Utopian peace base on merely sentimental grounds, but for a peace secured by so practicable an *entente* and pact between the great powers as shall, entirely aside from sentiment, work for the best welfare of the world, and until the great international compact be made, we shall be able to find safety only by adequate preparation to stand along against the dread eventuality of war." E. K. C.

NAVAL ACADEMY GRADUATES' ASSOCIATION

At a meeting of the Council held on March 29, the arrangements for the thirtieth annual reunion and dinner were completed.

The reunion will be held on Thursday, June 3, at the Naval Academy; business meeting at 3.30 p. m., in the Officers' Mess Building; dinner formation at 7.30 p. m. sharp, Blake Road. The dinner will be served in the Auditorium, Mahan Hall.

Graduates attending the reunion can have sleeping accommodations reserved for them in Bancroft Hall for the whole of June week, or for so much of that time as may be desired. These quarters are isolated and private. They will be reserved upon application to the Secretary.

To make the change in Art. 3, Sec. 1, which comes up for final vote at the business meeting, perfectly clear, the original section and the proposed section are both given.

Art. 3, Sec. 1 (original). "The dismissal from the navy, or the conviction in a court of justice of an infamous offense, of any graduate, shall constitute a sufficient ground for his exclusion from this Association if not a member, and for his expulsion if a member."

Art. 3, Sec. 1 (proposed). "The dismissal from the navy of any graduate, or the severance of his connection from any government service by reason of moral disqualification, or the conviction of a graduate in a court of justice of any infamous offense, shall constitute a sufficient ground for his exclusion from the Association if not a member, and for his expulsion if a member."

It will be noticed that the new section is of broader application and permits of the Association taking cognizance of cases which the original section would not permit. Of course any action under either section requires the majority vote at a regular meeting.

The below is taken from the dinner circular sent out last month.

The Council take this opportunity to call the attention of the Alumni to the Farragut memorial window project. Requests for a subscription of $5.00 from each graduate were sent out last September. To date about 800 have subscribed approximately $3200.00. Contracts for a $10,000 window have been signed and it is absolutely essential that the remaining 2500 and more graduates should send in their quota. It must be remembered that the project was approved at a duly constituted meeting of the Association, thus

legally binding every member of the Association to his part toward meeting the contract thus authorized; and placing certainly a moral obligation upon all those graduates who are not members of the Association, but who nevertheless voted in favor of erecting this memorial.

At the present time (May 10) the amount subscribed is nearly $4000. It is the intention of the Council to issue another appeal to those who have not subscribed, and it will be a great aid, from a clerical point of view, if as many as possible would send in their subscriptions prior to such time.

The following has been received, and is printed:

MILITARY ORDER OF THE LOYAL LEGION OF THE UNITED STATES, COMMANDERY OF THE DISTRICT OF COLUMBIA

At a stated meeting of this Commandery held at the New Willard Hotel, this city, the following preamble and resolutions were unanimously adopted by the Commandery:

WHEREAS, It is reported that the U. S. Naval Academy Graduates' Association have inaugurated a movement to erect a memorial window in the chapel of the Naval Academy, Annapolis, Md., to the memory of the late David Glasgow Farragut, U. S. Navy, and

WHEREAS, It is fitting that the glorious deeds performed by the great admiral during his life time, and especially during the Civil War, in defence of the nation, should be thus conspicuously emblazoned on the classic walls of the national institution devoted to the instruction of the future admirals of the navy, in order that these young men may be inspired to emulate his remarkable patriotic achievements, therefore be it

Resolved, That the Commandery of the District of Columbia of the Loyal Legion of the United States, extend to the Naval Academy Alumni its hearty sympathy and best wishes for the success of their efforts to perpetuate the memory of this great man, which will reflect honor upon themselves, their alma mater and their countrymen in general.

Resolved, That a copy of this resolution be sent to the committee having charge of the propaganda for carrying into effect this patriotic purpose, for the information of the U. S. Naval Academy Graduates' Association.

CHANGES IN REGISTER

678 Class '66 Little, William McC.
Ret., May 16, '84, Lt.; Capt.; died, Mar. 12, '15, Newport, R. I.

999 " '70 Fickbohm, Herman F.
Ret., June 30, '99, Comdr.; died, Apr. 22, '15, Chicago, Ill.

1231 " '75 Doyle, Robert M.
Ret., May 5, '15, R. Adml.

1477 " '80 Watters, John S.
Res., Dec. 1, '90, Ens.; died, Dec. 31, '12, New Orleans, La.

1574 Class '81 Clarke, George.
Hon. dis., June 30, '83, N. Cdt.; died, Jan. 17, '15, Tucson, Ariz.

1609 " '81 Perry, George E.
Hon. dis., June 30, '83, N. Cdt.; died, Apr. 13, '05, Cincinnati, Ohio.

1610 " '81 Hasson, Alexander R.
Hon. dis., June 30, '83, N. Cdt.; died, Apr. 9, '03, Washington, D. C.

1873 " '87 Logan, George W.
Died, Apr. 22, '15, Capt.; Naval Hospital, Portsmouth, Va.

2039 " '91 Macfarland, Horace G.
Ret., July 23, '09, Lt. Comdr.; died, Apr. 23, '15, Washington, D. C.

2186 " '95 Baldwin, Frank P.
Ret., Apr. 27, '15, Comdr.

2410 " '00 Bricker, William F.
Drowned, Mar. 20, '15, Lt. Comdr.; Constantinople, Turkey.

2600 " '03 Radford, George S.
Res., Mar. 29, '15, Nav. Const.; P. O. Box 2011, East Side Station, Bridgeport, Conn.

2645 " '04 Harrington, Charles A.
Died, Mar. 10, '15, Asst. Nav. Const.; Las Animas, Colo.

3234 " '08 Young, Robert S., Jr.
Res., Mar. 31, '15, Ens.; Concord, N. C.

3294 " '08 Leahy, Michael A.
Ret., Mar. 8, '15, Lt. (J. G.).

3332 " '08 Austin, Joseph E.
Dis., Feb. 15, '10, Midn.; appt. Ens., Act of Congress, Mar. 4, '15.

3580 " '10 Stolz, Melvin L.
Killed by fall from hydroaeroplane, Pensacola, Fla., May 8, '15, Ens.

3676 " '11 McGehee, Edward C.
Died, Apr. 22, '15, Ens.; Annapolis, Md.

3812 " '11 Clay, Henry S McK.
Res., June 30, '15, Ens.

3944 " '12 Abbot, James L.
Res., Mar. 12, '15, Ens.

3952 " '12 Whiteside, George W.
Res., July 9, '13, Ens.; Carrollton, Ill.

3967 " '12 Venter, Josiah G.
Res., June 8, '12, Midn.; Ass't Paymaster; Res., Mar. 28, '15, Ass't Paymaster; 421 Humphrey St., New Haven, Conn.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its forty-second year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:.

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

Sec. 8. The annual dues for regular and associate members shall be two dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be thirty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published every two months, and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1916

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1916. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

B. C. ALLEN,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

"A Personnel Reserve for the Naval Service."

"Value of Speed as an Offensive Element in Battleship Strategy and Tactics, as Compared with Armor."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

NERAL LIBRA

1914

The Great Lesson from Nelson for To-Day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

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